

The Chemical Age

OL LXIV

23 JUNE 1951

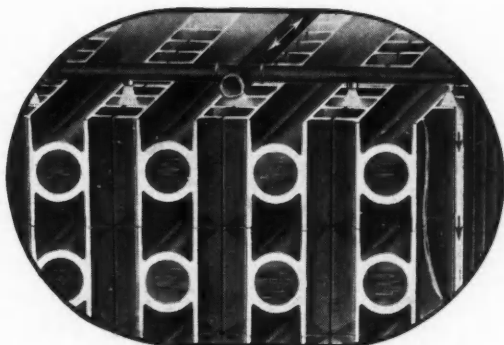
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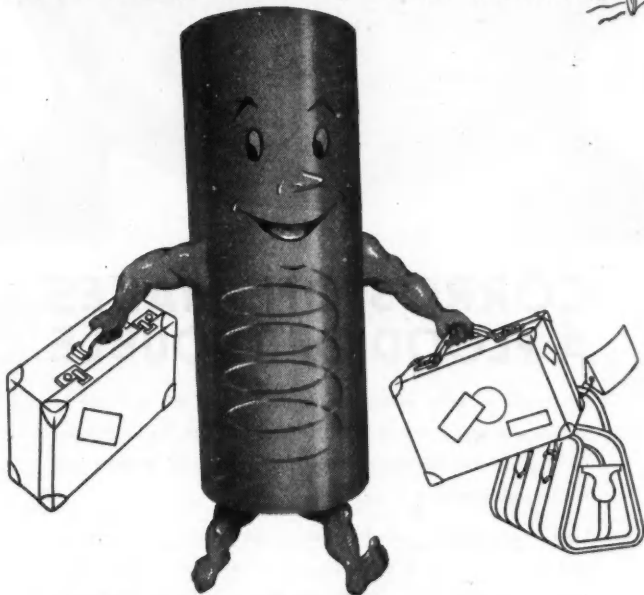
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i

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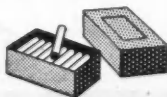
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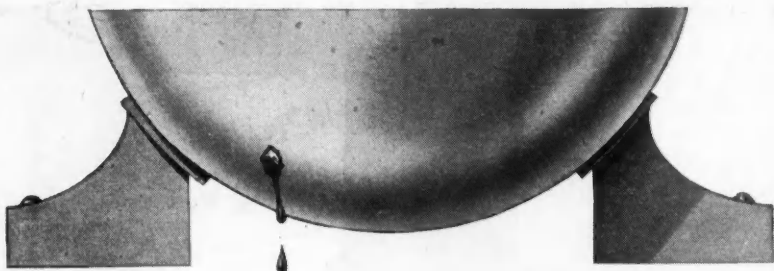


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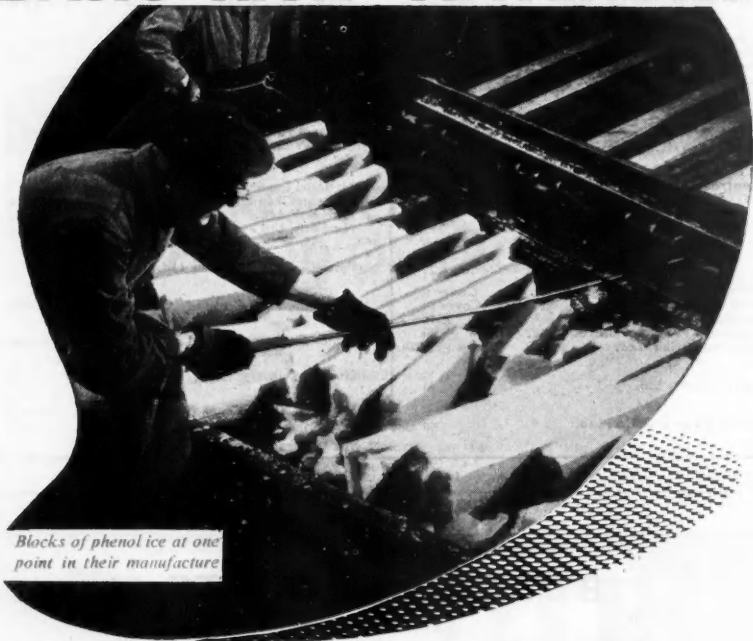
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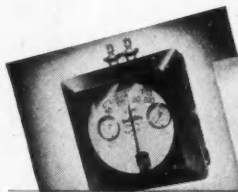
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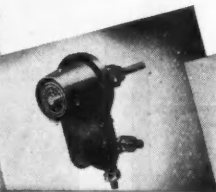
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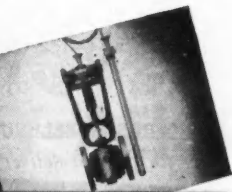
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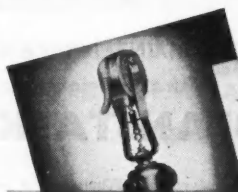
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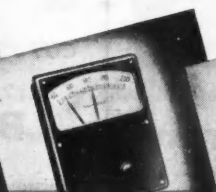
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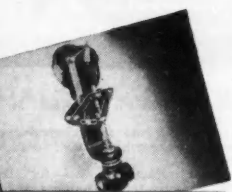
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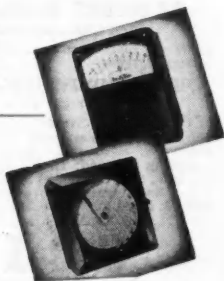
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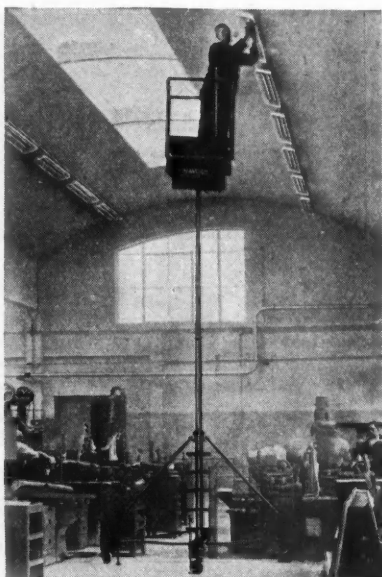
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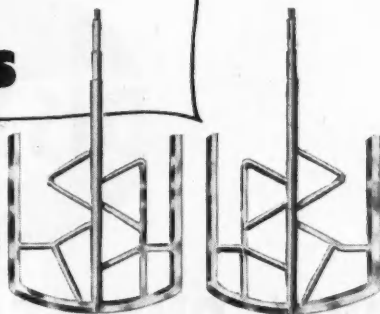
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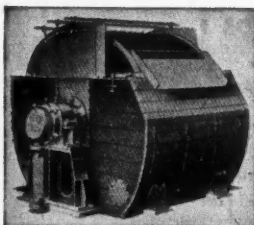
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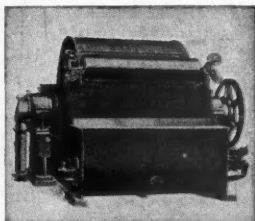
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Volume LXIV

23 June 1951

Number 1667

Notes & Comments

SHARP price rises for fertilisers have been expected for months and the new Order (operative from 1 July, 1951) is not so much surprising for the size of the price increases as for their differences for specific fertilisers. Thus, the standard price for sulphate of ammonia has risen from £13 1s. 6d. to £15 15s. 0d., or by approximately 20 per cent; but that for superphosphate has risen from £8 0s. 9d. to £14 13s. 6d., or by 83 per cent. Muriate of potash prices have increased by about 25 per cent, though the actual extent of increase varies with grade. This differentiation in price increase is likely to have a considerable influence upon the use of fertilisers in British farming. For as long as can be remembered in the industry, phosphatic fertilisers have always been relatively cheaper than nitrogenous fertilisers. Thus, in 1928 the value of a unit (1 per cent) of nitrogen from sulphate of ammonia was 9s. 9d.; and the value of a unit of phosphoric acid (1 per cent of P_2O_5) was 3s. 9d. to 4s. 0d. During the fully subsidised period, the unit prices of N and P_2O_5 remained approximately at 9s. 9d. and just over 6s. 0d. After 1 July, the respective prices per unit become 15s. 6d. and 16s. 4d. It is a major economic change. It is almost certain to encourage nitrogenous fertilising and to discourage

phosphatic fertilising for it occurs at a time when farmers are being driven (by the general level of fertiliser price rises) to give more attention to invoices and less to soil analyses.

THE fundamental need of much of our soil is phosphate. It is the base-dressing that enables sound plant-growth to establish itself. Nitrogen has long been under-used, very seriously so on grassland if not so obviously the case with arable crops; but an expansion in the supply of nitrogen will be effective only if it is based upon the present usage of phosphatic fertilisers. A relative rise in nitrogen usage and a relative drop in phosphate consumption will do harm both to farming and to the long-term cause of fertiliser technology. Our soils are rarely nitrogen-deficient, for nitrogen is not a soil-stored nutrient—it is an income nutrient rather than a capital nutrient. A large proportion of our soils are persistently phosphate-deficient. Most British soils respond well to nitrogen 'income' dressings, but the correction of 'capital' phosphate deficiency is a necessary prelude. Insofar as sound progress has been made through the years in fertiliser usage, nothing on the economic side has helped more than the fact

that a unit of phosphate has always been cheap. From now on, this perhaps fortuitous influence is dead. It might be thought that the exceptional advance in superphosphate price is a reflection of the sulphur shortage, but this is clearly not the explanation. The price for ground mineral rock phosphate has gone up too; here the unit cost has risen from 3s. 9d. (1949) to 8s. 3d. (after 1 July). No doubt the biggest difference in costs that is reflected in these sharply varied price rises for nitrogen and for phosphate is the difference involved in making an entirely home-produced fertiliser and in making fertilisers that are so heavily based upon imported raw materials. For the industry this may in the end be the brighter side of the price-changed cloud. After all, for many years it was the imported fertilisers that were cheaper and this period was certainly not the happiest in the history of the trade.

GLOOMY forecasts by all sections of American industry and education take the view that the supply of graduates in chemistry, engineering and chemical engineering is going to be woefully inadequate in the next decade to go anywhere near meeting the demand. The situation now is so acute that

industrial firms who want technical men are having to offer substantial attractions to intending applicants, ranging from complete blueprints of the candidate's probable future if he stays with the firm, to large financial inducements of the order of \$300 (£107) per month starting salary for holders of Bachelor's degrees, and \$350 for Master's degrees. Far-flung laboratories and works are finding it extremely tough because graduates are declining to work at any distance from home. Government laboratories, industry and defence plants are all in the same boat, and about the only concern that is not having staffing difficulties is the Atomic Energy Commission, which gets its men through the deans of colleges. Reasons for this stranglehold on American industrial expansion are given as three. The roots of it, says one supervisor of personnel, lie in the industrial depression of 1930, which reduced the birth-rate. As a result, he says, American enrolments with the technical colleges and universities are suffering. Engineering also suffered by World War II, when many of the returning G.I.s, being older and having less time available, studied general courses instead of technical ones. The third reason is the widespread impression after the war that in a few years

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the market would be flooded with engineers and chemists of all types. Business and the law gained proportionately, but those who were far-seeing or lucky enough to defy the popular trend and take technical courses, are now in the enviable position of being able to call the tune as far as employment is concerned. Depressing for employers, however, is the statistical fact that estimated needs for technicians of all kinds in the U.S. are going to increase by 25 per cent over the next ten years, whereas estimated supply is going to plummet by that amount in the next two years.

THIS situation is not without parallel in Great Britain, as Mr. Norman Fraser, chairman of the Chemical Engineering Group of the SCI pointed out at their annual dinner this year (see CHEMICAL AGE, 2 June, 1951). The supply of chemical engineers, he said, was not sufficient to meet the needs of the vast new plants at Wilton, Immingham, Grangemouth and elsewhere. While inducements to prospective technicians have not yet reached the heights in this country that they have in America, it is plain that we are beginning to feel the pinch. Unfortunately, while raw material shortage can sometimes be side-stepped to some degree, technician shortage cannot. There is no surer way of stopping industrial expansion, and the present dearth on both sides of the Atlantic bodes no good for the future of industry in the free world. Unfortunately it seems to be yet another aspect of the wider world problem of science outstripping its own resources, both physical, mineral, and moral.

* * *

AS a recent article by A. S. Richardson in *Chemical and Engineering News* pointed out rather succinctly, reading a chemistry degree in a few years' time is going to be rather like trying to catch a runaway horse. Quoting a recent estimate, the article says that if today a man should undertake to read just the basic journals of science, giving full time to the job and not pausing to understand all that he reads, he would need eleven years to wade through each single year's output of literature. The task of the modern chemist who

tries to maintain a broad knowledge of current chemical literature outside his own particular field grows incomparably more difficult each day. If it is hard for the trained chemist to keep abreast of current developments, how much harder is it going to be for the aspiring chemist? Already science has been divided into widely differing compartments that are as far from each other as oil chemist from astronomer, and each compartment is subdivided into as many parts. It is hard enough at present to give someone a basic grounding in chemistry alone (and even the universities do not expect a man to know the whole syllabus, or anything like it), but in ten or less years it is going to take a man his degree course all over again to catch up with his own particular branch of chemistry. At the moment vital and fast-moving research is going on at the extremities of chemistry that will soon make these particular fields as broad in scope as the rest of chemistry put together. The speed with which they progress is exemplified by the words of an executive reviewing plastics research recently. 'Of the many thousands of new plastics produced each year', he said, 'only a few of outstanding merit can hope to survive.' What will it be like in 1961?

THERE is no foreseeable remedy for this situation. Presumably what will happen is that science will become split up into smaller and smaller sections and teaching syllabuses will be more and more closely confined once they leave the elementary stages, until it takes a man a lifetime to catch up on himself. Already the difference between the great scientists of the 19th century, who could choose their field and explore it because they had little past history in that field to assimilate, and the modern product of university and college is so vast as to make them unrecognisable. This is certainly the age of the specialist. The trouble is that each year the specialists grow narrower in field, and fewer and fewer human beings understand each other's work. It is our loss that this way we lose a lot of that broader understanding of each other that is essential if we are ever to live tolerably agreeably with one another on this earth.

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Cuts in Less Essential Goods

BECAUSE of the increasing use of nickel in the Defence Programme, the Board of Trade and the Ministry of Supply are banning its use in the manufacture of a number of articles from 22 June, 1951.

The ban follows the cuts in nickel supplies for stainless steel production and nickel plating, announced by the Minister of Supply, Mr. G. R. Strauss, on 20 April, when he stated that the prohibition of the less essential end uses of nickel would follow.

The list has been compiled after consultation with most of the industries concerned.

The Orders—the Nickel Prohibited Uses (Board of Trade) Order, 1951, and the Nickel Prohibited Uses (Ministry of Supply) Order 1951—stop the use of nickel or austenitic stainless steels or nickel alloys in the manufacture of a large number of listed items. The principal nickel alloys involved are nickel silver, cupro nickel and monel metal.

The nickel plating of articles or components listed is also prohibited, but in order to give manufacturers an opportunity to make other arrangements, this provision will not come into force until 22 August. Plating will be allowed for a number of domestic items subjected to wear or severe corrosive influences, such as kitchen hardware.

Licences to manufacture prohibited articles may be granted by the Board of Trade and Ministry of Supply in the following circumstances:—

(i) For exports if, in the case of the goods listed in Schedule 1, the value of goods for export to dollar areas or to the Commonwealth is at least 15 times that of the nickel or nickel alloy incorporated in them and the value for exports to other markets is at least 50 times. This conversion factor will be calculated by comparing the export price (f.o.b.) of the goods with the cost of the nickel or nickel alloy they contain.

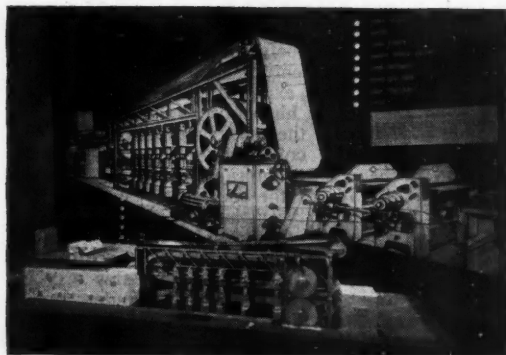
* Nickel plating will generally be allowed for exports if it is essential in marketing and if reasonable economy is used in its application.

(ii) If small quantities of the controlled material are needed to finish nearly completed articles, or to make essential functional parts.

(iii) If the controlled material is in a form which cannot be used for making anything but the prohibited article for which it was intended—manufacturers who are unlikely to use the whole of their present stocks by 1 October, should notify the Regional Offices of the Board of Trade or the Ministry of Supply as soon as possible, of the amounts they estimate will then be outstanding.

(iv) Where exceptional hard wear or corrosion makes the use of controlled material essential, such as nickel plating an article made of steel, which is in constant contact with water, or

(v) If the full application of the Order would cause exceptional personal hardship. The Orders are on sale at H.M. Stationery Office.



On their stand at the recent Plastics Exhibition at Olympia, the Vere Engineering Co., Ltd., demonstrated the manufacture and possible applications of 'Celloboard' which is made from prepared wood waste bonded with urea formaldehyde. By means of the 'Celloboard' machine a timber board can be produced in a continuous length and in widths up to four feet

Instruments for Chemical Plant

Part III—pH and Rate of Flow Control

MEASUREMENT of the pH of liquids has made rapid progress in the manufacture of chemicals, and a great number of industrial pH indicators, recorders, and controllers have found practical use. The most important method of measurement is electrical, and modern electrode instruments have been developed by interpreting the hydrogen-ion concentration in terms of electrical voltage. By choosing the correct logarithmic relationship between pH and hydrogen-ion concentration, an approximately linear relationship between pH value and measured voltage has been used. The antimony electrode combined with the saturated calomel electrode seems the most suitable combination for industrial purposes.

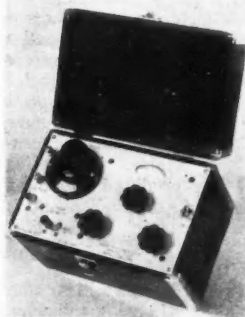


Fig. 1.—Self-contained pH meter

Of the great number of newly developed pH instruments only a few can be mentioned. Fig. 1 illustrates a handy pH meter as a self-contained industrial unit, assembled in a neat housing ready for use in the plant.

An industrial pH transmitter which has been specially designed for recording and/or controlling pH in chemical manufacturing processes is made by Electronic Instruments, Ltd. This transmitter is intended to link up with conventional types of recorders, or with electro-pneumatically operated automatic controllers, to provide a complete control system. This type model is supplied with an electrode assembly consisting of a glass electrode, a reference electrode, and a resistance thermometer, all mounted in a sealed holder to be immersed in the liquid. Temperature compensation is provided for and

the leads from the holder can be directly connected to the measuring instrument. It has a continuous low type electrode holder. For automatic pH control the measuring impulse can be amplified, and then used in a control mechanism either for two-step (on/off), or proportional, or derivative control according to process characteristics.

A measuring instrument for pH which uses the potentiometric principle and null point method is the George Kent 'Multelec' continuous chart potentiometer recorder. The electric circuit in its simplest form is illustrated in Fig. 2, and shows how the E.M.F. produced by the electrode system is balanced against a constant E.M.F. on a potentiometer bridge. Any variation of the pH unbalances the electric bridge, the galvanometer needle deflects, and the deflection is picked up by the relay mechanism and translated into rotation of a slide wire spindle. This rotation continues until the potentiometer is balanced with the recorder

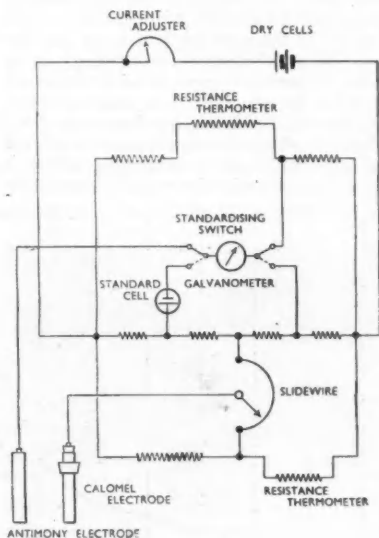


Fig. 2.—Circuit of 'Multelec' Potentiometer (Courtesy George Kent, Ltd.)

in the new position. By adding a control section to the measuring mechanism, automatic control of the acidity or alkalinity of many chemical processes can be obtained.

Recording Polarograph Analysis

This method is being used for the quick analysis of substances that are subject to electrolytic oxidation and reduction, such as nearly all non-ferrous metal alloys, and metals such as lead, tin, and cadmium in zinc base die castings, as well as trace materials in other fields. Speedy and accurate determination by putting a solution in the polarograph produces a polarogram, as shown in Fig. 3. Each step or wave of the curve can be analysed by the operator and indicates the amount of the element present. Briefly, mercury is dropped into the solution, and the current passing through the electrodes recorded, thus producing a plot of current versus voltage. This is all that is necessary. The dropping-mercury electrode consists of a fine bore capillary tube connected by a neoprene tube to a mercury reservoir. It is placed in the solution so that very fine drops of mercury are formed beneath the surface. One terminal of the instrument is connected to the reservoir, the other to a pool of mercury in the bottom of the solution vessel. A continuously balanced electronic recording potentiometer (Honeywell-Brown type) produces the required curves. The most useful applications in the fine chemical and pharmaceutical fields are where the sample for analysis can be taken from the continuous process in good time to make the required corrections

in processing. In the organic chemical industry analysis for organic constituents is a big improvement over former laboratory methods. It is often possible in batch processing of chemicals to produce a polarogram made from a good batch, and then endeavour to produce subsequent batches to give the same curve.

Rate of Flow Meters and Controllers

During the last two decades the use of rate-of-flow meters, operating on the differential pressure method with an orifice inserted into the pipeline carrying the measured fluid has greatly increased. The mechanisms used are based (1) on the U-tube manometer with mercury filling, (2) on the ring balance principle, (3) for small pressure differentials, on the inverted bell design, and (4) for larger differentials, on the elastic membrane, either flat, or as an aneroid manometer.

The demand for a simple, low-priced but reliable rate-of-flow meter for steam, air or gases produced development of a gadget which has quite recently been put on the market. Measurement of rate-of-flow for departments, or for single pieces of plant equipment using steam or gases is now possible without involving the use of expensive equipment. A simple, inexpensive Indicating Flow Meter produced by Spirax Manufacturing Co., Ltd., of Cheltenham, is shown in the accompanying illustration. (Fig. 4.)

The meter (for steam measurement) consists essentially of an orifice plate, two condensation chambers, a U-type manometer.

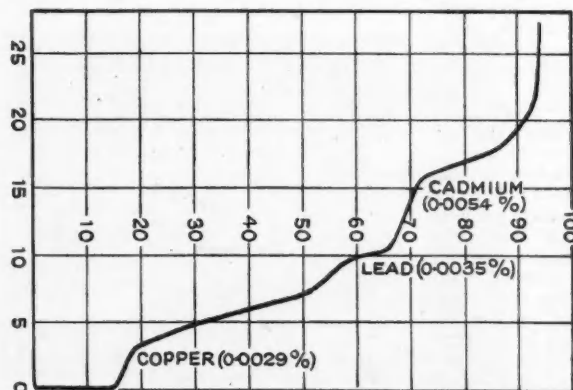


Fig. 3.—Polarogram of copper, lead and cadmium in die cast alloy
(Courtesy Dr. Prendergast, Chicago)

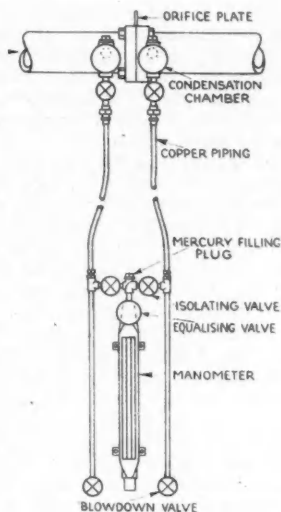


Fig. 4.—Standard layout of Spirax Steam Meter (Courtesy Spirax Manufacturing Co., Ltd.)

pipings and valves. The stainless steel orifice plate is mounted either between the flanges in the steam or compressed air main, or in a special orifice pipe supplied by the makers, which includes also the pressure tappings. Where measurement of steam is carried out the two condensation chambers are connected to the pressure tappings by short lengths of $\frac{1}{2}$ -inch pipe. Fitted immediately beneath these chambers are two $\frac{1}{2}$ -inch valves and half-unions, to which are coupled the copper pipes connecting the condensation chambers to the manometer. Two $\frac{1}{2}$ -inch blow-down valves are fitted at the bottom of the vertical lengths of $\frac{1}{2}$ -in. pipe so that the pressure pipes and condensation chambers can, when necessary, be blown clear of dirt.

The manometer itself is of mild steel and forged top and bottom blocks. The gauge glass, of boiler gauge glass quality, is further protected by plate glass in an anti-blast screen. On top of the manometer is an equalising valve which connects the two halves of the U-tube for setting zero. A steel ball check, at the base of the mercury reservoir, is fitted to reduce the amount of mercury which may be lost due to improper operation of the meter. (The makers supply

2 lb. of mercury with each meter, but 1 lb. 5 oz. only is needed to fill the manometer).

If the instrument is metering steam to a single large steam-using machine, it will enable the operator to learn that when he is doing a certain job he can get his best results when the instrument reads up to a certain mark. If the operator finds that he is needing progressively more steam to get the same result, then the efficiency of the machine is falling off.

The meter can be arranged with a single manometer which can be carried round and connected to a number of fixed orifice plates and condensation chambers at strategic points. Its portability seems to make this simple indicating flow meter, which is quite inexpensive an attractive proposition for almost any size of establishment, even at those small places where initial cost has previously ruled out the possibility of installing steam meters at the various points of usage.

The introduction of balancing torque tube flow meters which employ no stuffing box, packing glands or ground joint seals is regarded by chemical plant engineers as a definite improvement in design. The instrument shown in Fig. 5 uses an aneroid bellows element instead of mercury. The Aneroid Manometer has a much faster response to change of flow or level because the inertia of its mechanism is much less than that of a mercury-actuated instrument. This feature is of particular importance in control and pneumatic transmission applications, where an immediate response in the recording or controlling instrument is

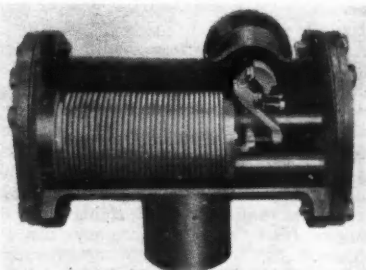
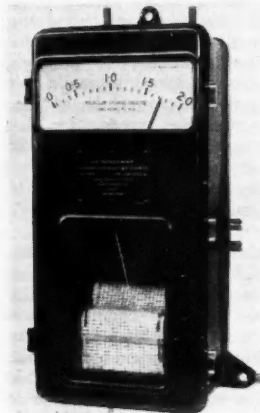


Fig. 5.—Short & Mason Aneroid Manometer for measurement of rate of flow and liquid level

essential. The bellows are anchored on the downstream side of the manometer and the low pressure is directed into it. The upstream (high) pressure is applied to the outside of the bellows, which contracts and expands with changes in the differential pressure. The bellows are extremely sensitive, and very small changes in differential will cause instant movement. The total linear movement is about 0.2 in. corresponding to a displacement of less than one cubic inch. The S. & M. manometer is available



**Fig. 6.—
Magnesium
chloride
solution
controller**

with bodies of 300 lb. and 1,500 lb. maximum working pressures and the usual differential ranges from 20 in. w.g. to 500 in. w.g.

Ring-balance instruments have been greatly improved in their design, and are still widely used for chemical processes, where chemical solutions, steam or gases have to be measured. A typical solution flow meter of this type is shown in Fig. 6 in the form of a continuous, chart-recording, indicating and integrating ring balance meter for magnesium chloride solution. This instrument can also be fitted with electrical transmission (telemetering to a distant panel instrument), etc. Combined pressure and flow recorders as double-pen instruments are also available, combining two measuring systems in a single instrument housing. It is claimed by the makers that extreme accuracy can be obtained for low pressure measurements, that small head loss is achievable, and that the instrument range can be easily altered.

It should be of interest to mention briefly a continental type of ring-balance instru-

ment which has been developed by I. G. Farben in Germany for very high pressures. This is contrary to the ring-balance principle as generally used, but its makers claim reliability and accuracy. The instrument, which has been mainly developed for high-pressure liquids and gases, is made for static pressures of up to 325 atm. and 700 atm. respectively. Special capillaries made from alloy steel are used for conveying the two pressures (upstream and downstream of the orifice) to the ring-balance tube. The instrument is also peculiar because it has no housing for protecting the large ring tubing, but several hundred of these instruments work in the various factories of this large chemical combine, to the satisfaction of the workmen.

A very new design, which is described by the makers (Messrs. Foxboro-Yoxall, Ltd., London) as a revolutionary development, is a pneumatic force balance device for the measurement and transmission of rate-of-flow and liquid level. It is called the d/p Cell, as shown in a cut-away view in Fig. 7. This simple differential element is flexible, readily calibrated, and converts a differential pressure into proportional air pressure. This latter output pressure can be conveyed to remotely located pneumatic receiving instruments for flow or liquid level. The

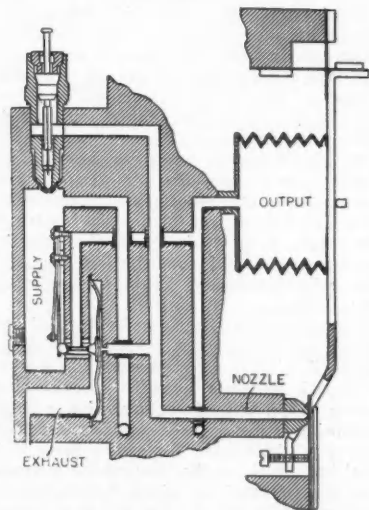
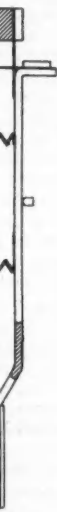


Fig. 7.—The Foxboro d/p Cell

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whole mechanism is housed in a compact unit, and as can be seen from the illustration there is practically no movement in its operating parts. The Foxboro d/p Cell mechanism is without mercury, has over-range protection, and is usually applied without seal and purge systems for liquid level measurement and control. The standard instrument range is from 100 to 800 in., up to 1,500 p.s.i. working pressure, a useful feature for use in certain processes, and the diaphragm (which is the deflecting element) can be made from bronze, nickel, or stainless steel. The d/p cell works from 17 to 20 p.s.i. air pressure at an average air consumption of 0.5 cu. ft./min.

The instrument operates as follows: pressures are applied to opposite sides of the diaphragm through high and low pressure connections. The resulting differential pressure, multiplied by the effective area of the diaphragm, produces a force which is transmitted through the force bar to the range rod imposes on the flexure-pivoted intermediate lever a force exactly proportional to the differential pressure on the diaphragm. The flexure tube supports the force bar and range rod and acts as a line seal.

Any tendency to move by the intermediate lever is detected by the nozzle which, operating through the relay, alters the pressure in the feed back bellows to balance the force imposed by the range rod, and thus maintains the intermediate level in a fixed position. The pressure in the bellows is always exactly proportional to the force applied by the range rod, which in turn is exactly proportional to the differential pressure on the diaphragm. The pressure in the bellows, then, is an exact indication of measurement and can be transmitted to pneumatic receiving instruments.

Positive over-range protection is provided by the machined inner walls of the cell body which exactly match the convolutions of the diaphragm. Two vent valves are provided to permit removal of entrapped fluids. Easily-removable glass cloth filters of fine porosity are provided at the high and low pressure connections to keep sediment out of the cell.

The Foxboro electronic type d/p cell converts differential pressure into exactly proportional electrical resistance which is transmitted to standard Foxboro Dynalog receiving instruments by ordinary 4-conductor electric cable. The electronic type offers maximum response to changes in the measured variable. It is similar to the pneumatic type except that bonded-wire type strain gauges (for converting motion into electrical resistance) applied to the flexure tube take the place of the range rod and the entire pneumatic system. Electric measurement makes it possible to include the electronic type d/p cell in a group or groups of measuring elements successively switched into a single Dynalog instrument. Ranges are 100 in. to 800 in.

Remarkable progress in design and also in practical use has been made during the last years in area meters, which are generally known in the chemical industry as Rotameters or Florators. Area meters of this kind comprise a tapered glass or metal tube with a float moving in the vertical body. Since the original patents were taken out in France in 1868, and in Britain in 1879, various improvements have been added to make the instrument more universal. From a local indicator instrument, the modern rotameters have been developed into remote indicating, recording and controlling instruments for the rate-of-flow of

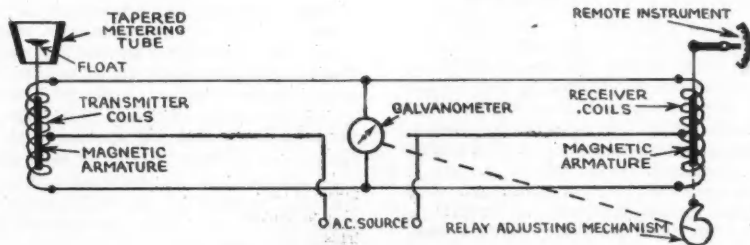


Fig. 8.—Electric Transmitter for Rotameter

liquids or gases. By designing a tapered metal tube with magnetic transmission of the float cone position, a measuring electric current can be used for electrical measurement and control. New designs enable opaque liquids to be measured, or vapours, or corrosive gases, and do away with the glass tube. Guided floats can achieve satisfactory density compensation. Fig. 8 shows an electric transmitter, using coils and magnetic armatures with a galvanometer mechanism and a relay adjusting cam mechanism. Rotameters for vapours containing condensables are now made, and these eliminate condensation on the float, which is hollow and connected to the piston by a hollow tube. Modern rotameters are adaptable for use in small and medium flow chemical processes.

(To be continued)

Atomic Energy Pact

American Firms to Explore Use of Power

TWO American firms—the Monsanto Chemical Company and the Union Electric Company of Missouri—on 6 June signed a joint agreement with the Atomic Energy Commission to explore the use of atomic energy for the production of electric power.

The signing concluded a year of discussions between Monsanto and the A.E.C., and will initiate immediately a research project in line with recommendations originally made by Charles A. Thomas, Monsanto president, in a speech at Hobart College, Geneva, N.Y., last June.

If the joint study is successful, it may lead to the design and construction of a privately operated plant which would make plutonium for the government and, at the same time, create electric power for private use.

Dr. C. A. Hochwalt, vice-president of Monsanto, will direct the combined Monsanto-Union Electric staff for the project.

The proposal as outlined by Dr. Thomas a year ago consisted of three steps: first, a study to see if it is feasible to produce electric power as a by-product of a nuclear reactor; second, for a private concern to design and build such a plant, and third, for the private company to operate it. Earlier this year, the A.E.C. advised Monsanto it was ready to go ahead with the first step.

Cost of the investigation, which will take upwards of a year, will be borne by Monsanto and Union Electric. The A.E.C. will make available to the companies information it possesses on the construction and operation of nuclear reactors.

J. W. McAfee, president of Union Electric Company, said that his firm is primarily interested in the initial phases of the research project. He added that Union Electric does not necessarily propose to join Monsanto in the actual construction of a plant, since there is currently no way of determining the most advantageous location for such a plant.

Dr. Thomas has outlined generally the method of operation which he believes the study will prove practical: The A.E.C. would send uranium to the private reactor to be used as a primary fuel. In the reactor the uranium would be transmuted to plutonium, which would be returned to the government for its atomic energy programme. The high heats which would develop in the reactor during the transmutation process would be passed through a heat exchanger where they would be converted to steam. The steam would be fed to normal-type turbines which, in turn, would operate generators that would produce electricity.

'It is hoped that our study will indicate that plutonium can be produced at lower costs than at present,' Dr. Thomas stated. 'It is also hoped that the study will result in information for providing low-cost electricity in areas where its production by other means would be too expensive.'

Increasing Output

According to recent reports, the Austrian Nitrogen Works, Ltd., which is in the American zone, last year produced 368,000 metric tons of calcium ammonium nitrate. Production at this plant started in 1946 with a total output of 40,000 tons. It increased to 109,000 tons in 1947, and to 266,000 and 296,000 tons in 1948 and 1949, respectively. Output for the first quarter of the current year amounted to 104,400 tons. Exports last year reached 312,600 tons valued at about 300,000,000 A schillings. Of these over 75 per cent were bought by European countries.

Coal Production Increased in 1950

Board's Report Outlines Scientific Achievements

IN the National Coal Board's Annual Report for 1950 it is revealed that during that year output from U.K. mines was 204.1 million tons—about $1\frac{1}{2}$ millions more than in 1949. The Government's open-cast sites produced 12.2 million tons, about a quarter of a million less. The total output of coal for the country was 216.3 million tons. Home consumption of coal increased by 6 million tons being 201.7 million tons; exports and bunker supplies were 1.4 million tons less than in 1949.

Output of coke from the Board's coke-ovens rose by more than 100,000 tons to 7.0 million tons. The supply of coke-oven gas for industrial and domestic use also increased.

In 1950, the Board earned a surplus of £8.3 million (compared with £9.5 million in 1949). The collieries made an 'operating profit' of £24.2 million (compared with £29.4 million). On carbonisation and other activities there was a profit of £2.3 million (compared with £1.7 million).

The Board began the year with a deficit of £12.3 million. So there remains £4 million to be eliminated before the Board can begin to build up reserves.

Science in Industry

Chapter seven of the Report is entitled 'Science in Industry' and it explains that the Board's scientific service is in two parts—first, scientific control, which applies science to the day-to-day tasks of securing safety in the mines, checking the quality of the coal produced and analysing the country's coal reserves; and secondly, research.

In 1950 (it states) one or more new Area laboratories came into use in every Division except the small South Eastern Division, where a Divisional laboratory was started. The Board issued the first part of a standard 'Analyst's Handbook' for their laboratories. This dealt with the analysis of mine roadway dust and mine air and the assessment of the best method of preparing various coals.

The Board is required by law to have regular tests of mine air, mine roadway dust, and the exhaust gases of underground diesel locomotives. As in 1949, more than

1,300,000 samples of roadway dust and nearly 400,000 samples of air were analysed.

Another main task of the Divisional Scientific Service is the control of coal quality. But in 1950 the service found time to carry out some special tasks. For example, by the end of the year a comprehensive survey had begun in all Divisions of water discharged from mines, to find out how far it pollutes rivers and streams.

Cleaning Studies

In Scotland, studies were made of the cleaning of certain fine coals. In Scotland, also, the experimental testing of domestic coals in standard grates (see Report for 1949, paragraph 248) was adopted for the regular testing of all coals going to the domestic market. In the Northern (N. & C.) Division the emission of methane from the workings at Haig colliery in Cumberland was studied. In the North Western Division, progress was made with the designs of an automatic alarm to help rescue teams detect carbon monoxide. At a colliery in North Wales scientists investigated corrosion of light alloy cages.

Research of value to the coal industry is carried out partly by the Board and partly by outside bodies. Some experiments within the industry are made by the Divisional Scientific Service, but the Board's main research effort is concentrated at their Central Research Establishment near Cheltenham. This was started in 1948 and is still growing. The principal outside bodies on whom the Board rely are the British Coal Utilisation Research Association, research associations connected with the coking industry, and the Universities. Research so far undertaken falls mostly under three heads: first, particular problems of mining; secondly, upgrading of coals and, thirdly, extending the range of coals which can be carbonised.

The Central Research Establishment also worked on various special problems of health and safety in the mines. The most urgent was an investigation into the causes of conveyor belt fires and means of preventing them, which continued into 1951. The Establishment co-operated with the Medical

Research Council and the Safety in Mines Research Establishment of the Ministry of Fuel and Power in devising more accurate ways of sampling and measuring dust.

Among work on upgrading coals was a series of experiments to see if the 'Phurnacite' process could be extended to other coals than that used at the existing plant. It was established that good briquettes can be made from some Kent coals. Coal could be upgraded in another (though much less important) way if 'hards' and 'brights,' which are sometimes found together in the same seam and have to be mined together, could be cheaply sorted by mechanical means. In 1950 the Central Research Establishment made an experimental device for separating them by using the reflection of light from the coal on to a photo-electric cell.

The British Coal Utilisation Research Association intensified their work (see Report for 1949, paragraph 267) on the firing of gas turbines by fine or pulverised coal. The association have an experimental gas turbine combustor unit in which low-grade fine coals are so burnt that the molten ash can be drained off.

Research into problems of carbonisation included work by the British Coke Research Association, the Government's Fuel Research Station and the Board to try to produce good metallurgical coke by blending good coking coal and coals not by themselves suitable for coking. The association also worked on standard procedures for sampling and analysing cokes to ensure consistent quality and for measuring the yields of coke, gas and other products of coke ovens.

There are purposes—for instance, making some foundry and blast furnace coke—for which coal is demanded with a guarantee of consistently low phosphorus or arsenic content. This has meant lengthy and costly analysis of the coals. In 1950, the Central Research Establishment developed a much quicker method of determining phosphorus content and began work on a similar method of analysis for arsenic.

The Coal Tar Research Association investigated ways of improving the quality and extending the use of pitch, a main ingredient of coal tar. They experimented with blends of tar oils and pitch for road surfacing and other uses. Work was also

done on the treatment of pitch for use as a binding agent for briquettes.

The Board for their part completed a rough analysis of all tars produced at their coke ovens and made a more thorough survey of some of those produced in South Wales. New techniques were adopted for determining the rarer constituents of these tars.

The British Coal Utilisation Research Association continued their work on ways of burning coal in stoves and grates with less smoke, and so more efficiently. With the help of Leeds University, they examined the combustion of tar, of which coal smoke largely consists.

Other work done by the Universities included that at Nottingham on a device for predicting the flow of air underground; at Birmingham, on percussive drilling; at the Royal Technical College, Glasgow, on dust produced in drilling; at Newcastle, on power losses in ventilating fan drifts; and at Cambridge on the physical structure of coal, using X-rays. Leeds University also used X-rays to examine clay measure shales, to help in the work of the Coal Survey.

Agricultural Conference

AN International Agricultural Conference is to be held at Fernhurst, Surrey, on 26, 27 and 28 June, for the reading of papers and discussion. A tour of Fernhurst Estate has also been arranged for the first day of the conference. Six papers in all will be read, opening with Sir John Russell, Kt., O.B.E., D.Sc., speaking on 'The Wastage of World Food Supplies through Pests and Diseases'. Sir John was Director of the Rothamsted Experimental Station until 1943.

The same afternoon W. G. Templeman, Ph.D., is reading a paper on 'Chemical Weed Control', and on the Wednesday a paper on synthetic organic insecticides—their value and limitation, is being presented by J. H. Stapley, B.Sc., A.R.C.S., Senior Entomologist at the Fernhurst Research Station. The development and uses of fungicides is the subject of another paper by J. F. H. Cronshey, M.A., Dip.Agric.; and K. M. Smith, D.Sc., Ph.D., F.R.S., Director of the Plant Virus Research Unit of the Molteno Institute at Cambridge, will read a paper entitled 'Control of Plant Virus Diseases'.

German Industry Expands

Greater Demand for Chemicals

THE decline of German chemical production caused by the fuel shortage during the winter has now largely been made good, and a further substantial output expansion is forecast by most manufacturers for the second half of this year. The production of basic chemicals, for which an increasing export demand is reported, is, however, still restricted by shortage of plant and raw materials. A number of intermediate products are wanted in growing quantities for shipment to the U.S.A.; demand for chemicals for the cosmetics and other consumer industries, on the other hand, is dull. Rising costs have necessitated a number of price advances in the domestic market; the Ministry of Economic Affairs is understood to be preparing an order raising the prices of nitrogenous fertilisers by 10-15 per cent. probably with effect from 1 July.

Potash production in the 1950/51 fertiliser year which has now ended shows an increase by 164,000 metric tons to 986,000 tons (K₂O); West German potash exports show an increase by about 50 per cent to 344,000 tons valued at £7,500,000, and a further advance of export shipments is expected for 1951/52 in view of the plant extensions under way. The leading potash companies which recently held their shareholders' meetings express themselves highly satisfied.

To Re-erect Ovens

Chemische Werke, Huels, has been authorised to re-erect four butadiene ovens partly dismantled in 1949 and to produce 1,500 tons of synthetic rubber per three months' period. Butadiene will at first be produced by the same process as employed in the past, but later is it intended to employ another process about which negotiations are now in progress. The company has also received a permit for the re-erection of six styrene ovens. It is expected that the new styrene capacity will be in operation by October and increase production of this material by half. The butadiene production will presumably begin a few weeks later; part of it will go to the Leverkusen plant of Farbenfabriken Bayer for the production of perbunan polymer.

Negotiations are also in progress with

French interests concerning the erection of a wood hydrolysis plant at Kehl on the Upper Rhine. There are now three hydrolysis plants in operation in Western Germany—at Mannheim-Rheinau, Holzminden-on-Weser and Tornesch near Hamburg—the two latter plants operating the Scholler process which is also to be used at Kehl. The cost of the scheme is estimated at Dm 10,000,000, while the production is to include 2,500 tons a year of crystallised d-glucose in addition to smaller quantities of by-products such as lignin, furfural, butanol and others. The raw material—20,000 tons (dry weight) of wood waste will be needed annually—is to be obtained from sawmills in the Black Forest and the woodlands of the Palatinate.

Methane Pipelines

Work has begun on the construction of methane pipelines connecting Stickstoffwerk Hibernia, Wanne-Eickel, with the towns of Gelsenkirchen and Essen, and Stickstoffwerk Gewerkschaft Victor, Castrop-Rauxel, with the town of Dortmund. These pipelines will be a substantial addition to the pipeline system for methane-burning road vehicles which has been in course of construction in the Ruhr area for some years. It began in 1948 with a pipeline connecting Ruhrchemie Holten with the towns of Oberhausen and Hamborn and was continued in 1949 with a line from Stickstoffwerk Hibernia, Wanne-Eickel, to Bochum.

Esso AG, the German subsidiary of the Standard Oil Co. of New Jersey, is building a distillation column at Hamburg-Harborn which will treat 140 tons of ordinary petrol a day for the production of special motor fuels. By 1953 the Hamburg-Harborn plant is to be extended from the present crude oil consumption of 630,000 tons a year to a capacity of 1,400,000 tons, and further distillation and cracking units as well as a plant for improving gasoline of low octane numbers, a unit for refining cracking gasoline and some other plants are to be provided at a total cost of over £4,000,000.

The West German mineral oil consumption last year is estimated by Deutsche Shell AG at 3,625,000 tons—44 per cent more than in 1949—to which are added 175,000

tons of black market petrol. At the beginning of the current year West Germany possessed a refining capacity, including the hydrogenation works at Wesseling and Gelsenkirchen, of over 5,000,000 tons a year, with the result that imports of refined products show a declining tendency while the use of indigenous and imported crudes continues to expand. Drilling operations in the domestic oilfields also increased last year, from 299,000 to 385,000 metres. In production, the Emsland district and the Hanover fields were equally important, and German oil geologists incline towards the view that the Hanover area may, after the recent promising discoveries at Suderbruch, Eldingen and Hohnhe, have as good long-term prospects as the Emsland, where, however, proven reserves are still substantially above those elsewhere in Germany.

More than £500,000 of ERP funds are to be spent on the extension of the lead mines at Mechernich in the Eiffel mountains. The lead deposits, believed to be the largest in Europe, have been worked again since 1948, and £250,000 of ERP funds have already been expended in an effort to reduce production costs. The ore contains between 1.5 and 2.5 per cent of fine lead, and the present monthly output of 99.99 per cent lead is 700 tons. This will be raised to 1,250-1,500 tons when the extensions are completed.

Polyvinyl pyrrolidone, which was made by Badische Anilin- und Sodafabrik, Ludwigshafen, on a substantial scale for the manufacture of Periston synthetic blood plasma during the war, and is still being used for this purpose, is now also used for several other purposes, such as the manufacture of a special product for dyers who employ it for removing colour from textiles, and of another product to be used as a cleaning agent in laundries.

To Study Conservation

Specialist Group to Visit America

THE Anglo-American Council on Productivity is shortly sending an unusual special mission to the United States. Scarce materials and their effective use are basic to the growing defence programme and to the further raising of productivity in this country. This special group is therefore going to the United States to explore the subject

with the engineering and allied industries there with a view to making suggestions as to how British industry can use scarce materials in the strictest possible way. In the metal-using industries we have now entered a period in which it will be increasingly necessary to employ 'skin-flint metal-lurgy'.

The group is a small and specially selected one chosen in consultation with a number of the principal trade associations and the Trades Union Congress. The following are the terms of reference:

This Specialist Group is to enquire into measures being taken and planned in the engineering and allied industries in the United States for the conservation and efficient utilisation of scarce materials. It is concerned primarily with the immediate short-term problem but would wish also to be put in touch with any long-term steps (involving basic changes in design) being currently planned. The following headings are suggested for the enquiry in addition to any others which may be proposed by the U.S. side:

1. Scarce materials substitution.
2. Emergency specifications and standards.
3. Direct economy measures.
4. Short-term alterations in design.
5. Simplification of product range to eliminate items using high proportion of scarce materials.
6. Factory re-organisation to ensure economy.
7. Possibilities of increasing co-operation between materials supplier and user.

Members of the group, the majority of whom are leaving for New York by air on 17 June, include:

Sir Graham Cunningham, K.B.E., LL.B. (Leader), chairman and managing director, Triplex Safety Glass Co., Ltd.; Henry Wilcox Bowen, managing director, E.M.I. Factories, Ltd.; Frank Edwin Chappell, director, Harold Whitehead & Partners, Ltd.; Francis Vincent Everard, works executive director, Bellis & Morcom, Ltd.; John Hampson, chief buyer, Leyland Motors, Ltd.; Donald Arthur Oliver, Metal Economy Advisor to the Ministry of Supply and Director of Research, The B.S.A. Group Research Centre; Major Philip Litherland Teed, Deputy Director of Aircraft Research and Development, Vickers-Armstrongs, Ltd.

German Synthetic Prowess

Features of the Hüls Acetylene Plant

OWING to the shortage of petroleum, Germany was obliged during the war to use acetylene as the starting material for a large number of chemical products. Many of the processes developed necessitated its use under conditions formerly regarded as too hazardous for practical consideration. Extensive research work was therefore undertaken by I. G. Farben to determine the conditions under which acetylene might decompose and the pressures developed as a result of decomposition. The remarkable success achieved by Germany in the handling of acetylene was due largely to careful study of its behaviour under varying conditions of temperature and pressure.

Of particular interest from the standpoint of handling techniques is the Hüls plant, details of which have been given in various BIOS and FIAT reports, where a number of valuable by-products, including various synthetic rubbers, are obtained from acetylene. This is the only plant known in which hydrocarbons are converted to acetylene in an electric arc. Its many other notable features include a novel purification process and the use of a mercury catalyst promoted with ferric sulphate for the production of acetaldehyde.

Production of Arc Acetylene

Under the preferred operation a mixture of natural gas and waste hydrogenation gas with a carbon number of about 1.5 is passed to the arc. At the time of the FIAT visits a local natural gas was being used containing about 94 per cent methane, 3 per cent CO₂, 3 per cent nitrogen, and 5 gm. sulphur per cu. metre. Coal gas was sometimes added. The gas was first run through an Alkacid unit, the sulphur being reduced from 5 to 0.05 gm. per cu. metre. It was then compressed to about 1.4 atmospheres absolute, and passed to one of the electric arc reactors. Fifteen pairs of these reactors were installed in parallel, one reactor in each pair acting as a standby.

The electric arc (D.C.) in each reactor transforms 7,000 kW of electrical energy at 8,300 volts and 850 amperes D.C. into heat. The length of the arc changes from 500 mm. up to 1,000 mm. In its core the arc burns

at about 3,000°C., while the gas temperature at the end of the reaction tube is from 1,600 to 2,000°C. At this point a quenching water spray is introduced which cools the gases down rapidly to 150-200°C., thus preventing further cracking. The pressure drop in the reaction is 0.3-0.4 ats. Each reactor provides about 4,200 cu. metres of product gas per hour from 2,800 cu. metres of feed gas. The product gas contains 12-16 per cent of crude acetylene, the conversion rate to acetylene being about 50 per cent per pass.

Removing the Carbon

The gas then passes to two cyclone separators in series, which remove about 70 per cent of the carbon in a dry form. In order to remove the remaining carbon the gas is washed in a water tower at 60°C. and is finally filtered by eight wool or cotton bag filters, which are warmed with steam to prevent water condensation. These filters are stiffened by a polymer and last for only 8 to 10 weeks before being replaced.

The carbon from the cyclone separators is blown with air to remove the grit. It is again collected by cyclone separators, granulated and sieved, the coarse material being bagged and the fines recycled to the granulators. The stream of 0.1 per cent carbon, suspended in water from the water scrubber and bag filters, first passes to a large rotating separator in which the carbon floats. The mass of 2 per cent carbon is scraped off the top and collected in rotating vacuum filters. Finally it is dried at 110°C. to 99 per cent carbon in continuous vertical shelf driers. Fire and dust explosions have occurred in the carbon handling apparatus, possibly caused by adsorbed higher acetylenes. Since the last serious incident the carbon has been dried in an atmosphere of nitrogen.

An outstanding feature of the plant is the purification process. In the preliminary step, the gas is first cooled with water and then passes on to an oil washer, where the benzene, naphthalene, phenyl acetylene, heavy oils and tars are removed. The plant was originally designed to use aliphatic oils, but after the war it was operating with an

aromatic oil having a boiling range from 230-350°C. The temperature preferred for carrying out this oil wash is 15-20°C. The gas then passes to a water washer to remove hydrogen cyanide, and finally the hydrogen sulphide is taken up by ferric oxide in a sulphur-removing tower. This step was the most unsatisfactory feature of the whole process and was a source of considerable trouble during later stages.

Hazardous Operation

Among the more hazardous operations is the separation of the various higher acetylenes present, such as methyl acetylene, ethyl acetylene, vinyl acetylene and diacetylene, and the higher homologues from acetylene itself. Intensive study of these dangerous products was only undertaken after serious explosions had occurred in the original plant.

The purification is done by oil scrubbing, low temperature purification being preferred because a 97 per cent in place of a 94 per cent acetylene product is obtained, and because the by-product can be recovered. In the low temperature plant the gas is first compressed to about 1.4 atmospheres absolute, cooled to 20°C. by a water spray, and then passed into two coil coolers and cooled to -12°-0°C. by the final, cold, purified acetylene from the acetylene washer. The water is removed as an ice deposit in the coils, and by exchanging back and forth between the two coolers the ice can be melted off. The gas then passes to two coolers in series, run at -25° and -55°C. respectively. Finally it passes to a low temperature coil cooler where it is cooled by ethylene to -78°C. It then passes to the first cooler and finally to the aldehyde plant.

That section of the plant was destroyed shortly after it was put into operation and seven men were killed. This led to considerable research in the handling of higher acetylenes. It was reported that the most important point was to keep the diacetylene below 12 per cent in any mixture. Methanol is the most practical diluent, and no good inhibitors have been found.

In apparatus of the Linde Company's design, sub-zero temperature fractionation operations for the separation of hydrogen and ethylene are carried out both on the stream of crude acetylene coming from the dissolution of the arc gases in water and on the crude mixtures of other gases, princi-

pally ethylene and hydrogen, which are not dissolved in the acetylene concentration operation.

The Hüls plant has yielded the most complete data on the process developed by I.G.F. for the manufacture of acetaldehyde from acetylene and water, using a mercury catalyst promoted with ferric sulphate. This method is a great improvement on the older and well-known process which uses mercurous or mercuric sulphate in sulphuric acid, without an oxidising promoter present. The new process greatly decreases the cost of the plant by minimising the equipment required for catalyst recovery and regeneration, while manufacturing costs are reduced by the decreased handling of mercury-containing materials. Whereas the older known processes were, at best, semi-continuous, the new process is entirely continuous.

Fresh acetylene gas of 97 per cent purity is fed to the process at the rate of 1,500 cu.m./hr. This is mixed with 830 cu.m./hr. of recycle acetylene having a composition of about 80 per cent acetylene, 5 per cent CO₂, 30 mgm. acetaldehyde per litre, the balance being nitrogen and hydrocarbons. This gas is saturated with water. Also mixed with the fresh incoming acetylene are 470 cu.m./hr. of 96 per cent acetylene gas, recycled to the converter from the acetylene recovery system and specifically from the gas release scrubber. These gases are combined and enter an Elmo water ring pump, where they are compressed to 1.3 ats. ga. pressure, and simultaneously are saturated with water. The gases then pass to a low velocity entrainment separator, where the entrained water drops from the gas stream and is returned to the Elmo pump.

Catalyst Composition

The gas enters a vertical riser of a leg extending to the top of the converter. At the top of this leg, steam at 2.5 ats. ga. pressure is injected into the gas stream at the rate of 1.5 tons/hr. The mixture then passes through a vertical downcomer and enters the bottom of the converter. The converter is filled with liquid catalyst solution to the top of the smaller diameter section. The catalyst composition is maintained at 40 gm. per litre of iron, of which 10 per cent is ferric and 90 per cent ferrous, 180 gm. per litre of sulphate (total), and 0.6 gm. per litre of mercury as HgSO₄. This composition corresponds to the 'spent' catalyst.

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which is continuously withdrawn from the unit at the rate of 2.5 cu.m./hr. Fresh regenerated catalyst is added continuously at the rate of 2.5 cu.m./hr., its composition being the same as that of the 'spent' catalyst except that all the iron present is ferric. The spent catalyst is withdrawn from the top of the smaller diameter section, while fresh catalyst is added at the bottom of the unit. In addition, about 350 kg. of metallic mercury is kept in the hydration, being mostly suspended in minute particles throughout the catalyst mass by the action of the feed gas entering the bottom of the reaction. The catalyst composition is controlled by maintaining 0.6 gm./litre of soluble mercury as HgSO₄. Grab samples are taken periodically for analysis.

The gas enters the reaction and bubbles upwards through the catalyst mass. About 55 per cent of the acetylene fed to the unit is converted to acetaldehyde and by-products. The reaction is adjusted to give temperatures of 97 and 94°C. at the bottom and top of the unit respectively.

The gas vapour stream passes through Buna-lined piping to the bottom of the primary condenser, where the steam is cooled to 85°C. The uncondensed steam then passes through a cyclonic separator for the removal of entrained and mercury particles, which return to the converter, and is then further cooled to 60°C. by 40 cu.m./hr. of cooling water. The condensate from this unit is a weak water solution of acetaldehyde, which is sent to crude acetaldehyde storage.

Uncondensed Vapour Scrubbed

The uncondensed vapours are scrubbed counter-currently with 11 cu.m./hr. of acetaldehyde solution and pumped to the tower. The effluents leaving the bottom of the tower are pumped directly to the crude acetaldehyde storage tanks. Uncondensed vapours leaving the top of the scrubber are sent to the acetaldehyde absorber.

The gas stream is conducted in the absorber by 36 cu.m./hr. of water containing dissolved acetylene, which comes from the acetylene recovery system. The acetylene is mostly released from solution as it enters the absorber and passes out with the unabsorbed gases, which are then recycled to the converter. The water phase serves as an absorbent for the acetaldehyde content in the incoming gas stream. The solution in the reservoir bottom section of the tower

is 8-19 per cent acetaldehyde, which is sent to the crude acetaldehyde storage tanks.

Gases leaving the top of the absorber are at about 30°C. and amount to some 1,130 cu.m./hr. A side stream of 300 cu.m./hr. is withdrawn and sent to the acetylene recovery system, where acetaldehyde and acetylene are recovered before inert gases are discharged into the atmosphere.

Metallic Mercury Recovered

In the distillation section crude acetylene from the storage tanks is passed over coke filters, where small amounts of metallic mercury are recovered. It then goes on to the first preheater, where it is heated to 100°C. by bottoms leaving the fractionating column. These bottoms are cooled from 135 to 65°C. and are discharged as waste. The overheads to the column leave at 50°C. and pass to a double tubular condenser. The distillation section operates at 2 ats. ga. pressure, measured at the condenser.

The condensate leaving the condenser passes to a split flow tank, which also serves to release and separate the dissolved gas from the solution in the condensate. The condensate is split into two streams, one being returned to the column as reflux and the other being forward flow. Both streams pass through small mercury traps. The forward flow is then fed to the top plate of an acetylene stripping column, where the dissolved acetylene is drawn from the product acetaldehyde. Overheads from this stripping column pass to a main column condenser inlet. This reboiler pot overflows the product to a product cooler, where the aldehyde is cooled to 20°C. or below before being expanded to the atmospheric pressure storage tanks. It is then ready for distribution to use points. The final product is 99.9 per cent acetaldehyde with a slight trace of crotonaldehyde, the balance being water.

Mercury is separated from the spent catalyst withdrawn from the converter, which is stripped of aldehyde and acetylene in a degassing column. The spent catalyst is received in one of two Buna-lined tanks, where the metallic mercury separates into the conic bottom for periodic withdrawal for recycling to the system. The supernatant liquid is then pumped to a rubberised plate and frame filter press, where the mercury-containing sludges are removed and sent to the mercury recovery section.

Finally the filtered spent catalyst solution is pumped to oxidation tanks. Thirty per cent nitric acid is pumped from the nitric acid storage tanks to the oxidisers and released beside the filtered catalyst solution, the feed rate being so regulated that only sufficient nitric acid is used to convert all ferrous sulphate to a ferric state. Live steam is also introduced into the chamber in sufficient quantity to maintain the oxidiser at the desired temperature. The nitrous oxides liberated in the reaction are saturated with water vapour and sent for recovery.

References: FIAT Reports Nos. 720, 855, and 921; BIOS No. 1558.

Italian Sulphur

ECA to Assist Development Plan

PLANS to double Sicily's exports of sulphur within a year, and so make a vital contribution to the Atlantic Pact economy, will soon take effect according to reliable reports. The Italian Chamber of Deputies has already passed credits totalling about £5,000,000 for development programmes in Sicily, and when these become law, after approval by the Senate, the United States Economic Co-operation Administration (ECA) are expected to advance £1,500,000 immediately so that operations may begin.

The United States and Sicily are the only countries which produce sulphur in great enough quantities to have an export surplus, and the U.S. alone cannot satisfy growing overseas needs and build up her own stocks.

Sicily, however, can easily increase her output, according to American and Italian experts. For years inefficient operation and antiquated equipment have kept Sicilian sulphur production at a minimum. In addition apathy, due chiefly to the lower cost of sulphur production in the U.S., has blocked exploration for this precious mineral. Sicily's present annual output is about 1,700,000 tons of crude sulphur and 213,000 tons of fused sulphur.

Italian sources put the West European sulphur deficit at about 800,000 tons a year. The consequences of the inability of the U.S. to fill this need was shown in a report last February by the committee of the Organisation for European Economic Co-operation (OEEC) on raw materials. The committee urged member governments of the OEEC to increase sulphur production

and to introduce more effective recovery of waste sulphur-containing products.

They added a warning that the almost complete stoppage of American sulphur exports from September to December last year considerably reduced stocks in the consuming industries in Europe, and that the effect of the reduction would become serious in the first quarter of 1951 throughout a whole range of important industries.

With this huge field opening before them the Italian Government intend not only to increase the Sicilian sulphur output, with American aid, but also to explore the mainland. Surveys are being made along the Adriatic coast to find new deposits, and old mines in the Adriatic coast district of Pesaro may be reopened if it is found that they can be worked profitably with modern equipment.

New Furnace Scale Remover

THE complete removal of furnace scale, one of the most difficult problems in the heat treatment of steel forgings, can be effected by a new pre-heat chemical bath just introduced by the Pennsylvania Salt Manufacturing Co., Philadelphia, Pa. It is said to save 90 per cent in cost compared with previous methods, and consists of a new product, Pennsalt SR-4, dissolved in weak muriatic acid and water. This bath needs no heating and can be made up in ordinary rubber-lined tanks. Parts covered with forging scale are immersed in the bath for five minutes and may then be placed directly in heat-treating furnaces (or stored for later treatment) at 1,500-1,600°F. for the minimum time consistent with good metallurgical practice. An additional saving is that the forgings can be heat-treated in a non-reducing atmosphere or without any prepared atmosphere.

After the heating the forgings are water-quenched and tempered. In conventional operations the scale is then removed by expensive sand- or shot-blasting, but with the new bath this is eliminated in most operations as the quenching actually blasts the scale off all surfaces, leaving them perfectly clean for subsequent machining. Good results have been obtained, say the company, with plain carbon steel grades and some SAE alloy steels. The product is undergoing field tests in industry at the moment to find out its effectiveness on other alloys.

BSI Golden Jubilee Exhibition

A Measure of Industrial Progress

THE Golden Jubilee of the British Standards Institution is being celebrated this year by an exhibition at the Science Museum, South Kensington, opened on 18 June by the Rt. Hon. George Strauss, Minister of Supply. Introducing him at the exhibition, Sir John Anderson, President of the Institution, said that the presence of Mr. Strauss indicated the welcome interest displayed in the activities of the BSI by His Majesty's Government.

Mr. Strauss opened his speech by dwelling on the purpose of the exhibition. It was not often, he said, that Britain blew its own trumpet—about once in every 100 years—and it was fitting that during the Festival year some slight notice might also be taken of some of her activities which were not quite so widely known in public. The BSI, a modest institution, had, he was glad to say, agreed to this exhibition in celebration of its Golden Jubilee, as a small contribution to informing the public, and as an example of the enormous range of fields covered by the BSI.

Freedom of Design

Mr. Strauss remarked that 'standardisation' was usually taken to mean drab uniformity. This was not the case with the BSI, who sought if anything to give greater freedom to the designers and the draughtsmen by increasing production and reducing the stocks that had to be held by manufacturers. The scope of the BSI was exemplified by the fact that it had 60 committees working under its direction, divided into four main groups, and that the number of members serving those committees, all quite voluntarily, was in the region of 13,500—an indication of the support that the movement had in industry. Moreover, said Mr. Strauss, it had great prestige among foreign manufacturers, who had not only accepted British standards in their own imports, but had frequently adopted the standards themselves, although some of them did not conform to the principle which we held in this country—that of voluntary consent to the standards.

Mr. Strauss said that during his sojourn as Minister of Supply he had had very many

opportunities of talking to works managers and the like, and all of them stressed the importance of standards in industry and the need for still further efforts—a need doubly necessary now that rearmament is upon us. Moreover the Anglo-American Councils on Productivity had all made the same point, and wide public interest in the subject was exemplified by the fact that a publication issued by a committee set up by Mr. Strauss in 1948 on standardisation, sold 10,000 copies.

The Exhibition

The exhibition itself is laid out on the gallery of the museum on the first floor. Generally speaking, it seeks to show, either in the flesh or photographically, the standard types and sizes of products in all sections of industry, together with examples or descriptions of their uses. An interesting stand is that depicting chemical and scientific glassware. A typical example of the virtues of standardisation, this shows the use to which the interchangeable ground glass joint has been put. A range of standard glass flasks, heat exchangers, fractionating columns, together with a complete model of a sulphuric acid plant for producing the acid at a rate of 25 tons a week, made by Quickfit & Quartz, Ltd., is on show, besides standard laboratory testing equipment such as Pregl carbon and hydrogen combustion trains; viscometers, distillation apparatus for determining water contents; Kohlrausch flasks, volumetric cylinders, flasks, pipettes, and all the other standardised measuring apparatus in glass, as well as thermometers, lactometers, haemoglobinometers and a host of other examples of the highly defined apparatus now used in the laboratory.

In the field of metals, stands are devoted to showing the advent of standards in the fields of lead, aluminium, copper, zinc, and iron and steel. Lead, by the Lead Industrial Development Association, is shown in pipe, sheet and strip form, together with specifications as to composition, quality, thickness, grain, ductility and uniformity; examples of a spectrograph analysis band and the turn-pin test for checking ductility are also shown.

Aluminium is very involved with standardisation, due to its wide use in the aircraft industry. Broadly, controls on composition are also applicable, as in the case of lead, and a photograph is shown of a new alloy made from the aluminium from salvaged aircraft; standards also cover the composition, heat treatment and tensile strength of alloys, and applications.

Copper, one of the oldest worked metals, has benefited greatly from the standardisation of electrical requirements. Various conductor sections for overhead power transmission are shown on a stand by the Copper Development Association, together with examples of high-conductivity bar and rod. The standardisation of alloys—covered by 23 different standards, a reduction by many hundreds of the number of alloys once in use—is exemplified by a display of an aluminium bronze ingot, and high tensile brass and gunmetal castings.

Zinc Standards

The standards covering zinc and its alloys and applications are shown on a stand by the Zinc Development Association. These applications cover zinc on galvanised wire and other materials, the thickness of coatings on electro-plated iron and steel, and the composition and testing of zinc alloy die castings, which must be very pure.

The Iron and Steel Corporation has arranged a comprehensive stand showing the multitudinous applications of steel in which standards are involved. These cover nearly all the products the industry make, from general engineering and electrical engineering goods to mines and mining equipment. The range of testing equipment for gauging the properties, both mechanical and chemical, of the steel they produce is amply shown. Some of these methods of testing were among the first to be standardised.

Also shown are illustrations of the efforts that have been made to reduce steel specifications from the original 1,500, to a figure of 100, as well as an exhibition on the fundamental standardisation of screw threads.

The stand devoted to paints by the BSI is colourful. Standardisation in this industry has been in progress for twenty-seven years, and covers mostly the raw materials used by the industry. A range of 42 standards for pigments of various colours is on show, as well as 22 for other basic

materials such as oils and varnishes, and instruments for checking standard specifications. The process ink stand by the British Federation of Master Printers is similarly colourful, and the three-colour printing process is shown strikingly, by stages.

The scientific instruments section shows an impressive array of equipment for the testing of materials. Some of this equipment is on view because the instruments themselves are standardised, while others are used for testing the standard specifications of other instruments or materials. A pH meter is shown, together with a bomb calorimeter, a density hydrometer and various thermometers. Visual tests are demonstrated by several 'Eel' instruments—a glossmeter, a plating thickness meter, a vertical comparator and so forth. Interesting is a small display of earlier work during the first World War carried out with the object of standardising screw threads for optical purposes.

Among the more modern applications of standards is in the plastics industry which has been quick to see the advantages of adhering initially to standards. Examples of different moulding powders of standard composition are shown—polystyrene (red), cellulose acetate (pink), amino-formaldehyde (cream), and phenol formaldehyde (brown). Various articles made from plastics are also shown. One standard just issued is the first standard glossary of terms used in the plastics industry to be issued by any country. This should influence choice of plastics terminology in a very broad field.

Benzole Testing

The National Benzole Association is showing a stand devoted to the testing for purity of benzole and allied products. These tests involve a copper strip test for corrosive sulphur, an oxidation test for gum-forming properties, done by weighing the amount of gum left on oxidation—and a method of determining the amount of toluol recoverable from crude benzole. Accurate and rapid determination of the organic sulphur compounds thiophen and carbon disulphide are also shown—the estimations are done colorimetrically, and the tests are sensitive to 3 parts per million of sulphur.

Many other stands are also on view at Kensington. They all combine to show the extremely wide range of activities with which standardisation is concerned.

Overcoming the Sulphur Problem

New Plants Planned by Laporte Chemicals

THE need for this country to have adequate supplies of sulphuric acid if it is to survive as an industrial power is emphasised by Mr. L. P. O'Brien in his statement as chairman which is to be submitted at the 44th annual general meeting of Laporte Chemicals, Ltd., at Winchester House, Old Broad Street, London, on Tuesday, 10 July.

Sulphuric acid is essential for the manufacture of titanium oxide by the N.T.P. process and part of the planned expenditure by National Titanium Pigments, Ltd., is for a sulphuric acid plant to produce 100 tons of strong acid per day from pyrites because elemental sulphur as a raw material may be unobtainable in the future.

There is an elemental sulphur-burning acid plant at Luton and two subsidiary companies, John Nicholson & Sons, Ltd., and Hunt Brothers (Castleford), Ltd., burn a considerable quantity of sulphur in their Yorkshire plants. A second pyrites-burning plant to produce 100 tons of strong acid per day has been ordered to be erected at Castleford, to ensure no permanent interruption to business.

Pyrites-burning plants of the type ordered are very expensive and because of the high amortisation amount which it will be necessary to provide, it will be essential to receive higher prices for sulphuric acid made from these plants than from sulphur burning plants. There are, however, acid users who are willing to contract ahead for several years at cost plus for output from these plants.

Future Acid Plans

At present there is not sufficient sulphur to meet demands, and prospects are that there may soon be even less. Supplies of pyrites have been assured for several years after the new plants are ready to burn it.

No plethora of acid production seems likely for some time ahead, so it was considered advisable to provide for the future needs of the company and its customers. The new plants can be regarded as a sound investment.

Except for National Titanium Pigments, Ltd., output of which was reduced in the fourth quarter through shortage of sulphuric acid, the parent company and the

subsidiaries have been at full stretch of production in almost every department, and there are similar prospects for this year, except possibly in the acid plants.

To ensure continued prosperity in future years, the research departments are being strengthened. For example, the company has just completed extensions to existing laboratories at a cost of about £50,000, so that the increasing numbers of the highly qualified scientific staff shall be properly housed and equipped.

Faith in Research

Research is not usually a short-term investment; it often takes some years to realise the benefit of patient work, but the company has faith in its research departments and experience shows it is now benefiting from work done in past years.

For example, the new hydrogen peroxide plant came into production early in 1950. It has been successful from every point of view. Despite the much heavier amortisation charge to be borne as compared with older plant, the final cost of production is low enough that, so far, helped by the spread of overheads on the greater than expected output, all the higher prices for fuel, electricity, wages and so on, have been absorbed without putting up selling prices for hydrogen peroxide, which have not been increased for 3½ years. In the circumstances, there is every confidence in the gainful employment of the extension of the plant now being undertaken and which should start working before the close of this financial year.

Present production methods, good as they may be, cannot be relied on indefinitely; for any further extensions and replacements still more improvements may be introduced and possibly entirely new ways of manufacture.

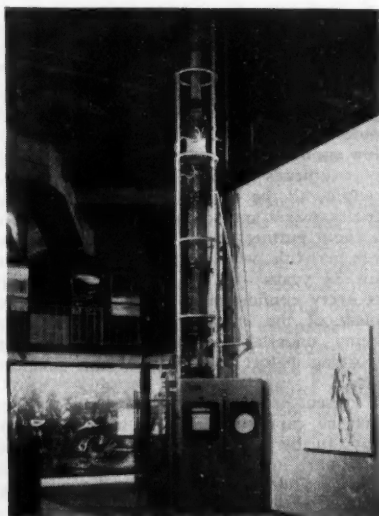
Mining operations of Malehurst Barytes Co., Ltd. (a subsidiary), have been extended to Devonshire, having acquired the Bridford Mine, from which barytes is won for use in the barium plants of the parent company. The output from this mine, together with that from our Silverband Mine in Westmorland, leaves the company largely independent of outside supplies.

New U.S. Reforming Unit

High Conversion Catalyst Claimed

THE Houdry Process Corporation of America announce the installation at the Sun Oil Company's Marcus Hook, Pa., refinery, of a new type refining unit for the catalytic reforming of low octane petroleum naphthas, for the production of high yields of aromatics and high octane aviation and motor fuels.

The new Sun Houdriformer will have a charging capacity of 11,000 barrels per calendar day of naphtha. Operating in conjunction with the new Sun Arosorb process for aromatics purification, the new installation will produce more than 13,000,000 gallons per year of chemical grade benzene, 30,000,000 gallons per year of chemical grade toluene, and 15,000,000 gallons per year of aromatic aviation gasoline blending



Exhibited by Quickfit & Quartz, Ltd., of Stone, Staffs, in the Dome of Discovery at the Festival of Britain, this 26-foot absorption tower for reclaiming concentrated hydrochloric acid, produces 2,000 lbs. of 30 per cent acid every hour. The automatic control panel was supplied by Elliot Brothers (London) Ltd.

stock for the production of Grade 115/145 aviation fuel. Construction of the plant is in progress, and completion of construction is expected by the autumn of 1952.

An important feature of the Houdriforming process is the catalyst, a development of the Houdry Laboratories. This has specific properties for the high conversion of naphthas, and is capable of operating continuously for very long periods without regeneration. It can also be regenerated *in situ*. Another important feature of the process is that sulphur compounds are removed. As a by-product, hydrogen gas of very high purity is produced in large amounts.

The Houdriforming process can also be used to produce high yields of high octane motor fuels. A low octane mixed base straight-run naphtha has been processed in pilot plant runs to yield a gasoline having, it is claimed, a 98 research octane number without tetraethyl lead, with a yield of 86 volume per cent gasoline of 10 lb. Reid vapour pressure. With the addition of tetraethyl lead, the product has a research octane number well over 100. Even higher gasoline yields are obtainable.

The Houdry Process Corporation plans to license their process to other refiners. The plants can be built in all sizes. Plant costs will vary, depending upon location and other factors, but are expected to be not over \$3,000,000 for a 10,000 barrels-per-day plant.

Fertiliser Prices Increased

THE Board of Trade have issued an Order, which increases, with effect from 1 July, 1951, maximum prices for fertilisers in Great Britain and Northern Ireland. These increases are due generally to the final withdrawal of the subsidy and to foreseeable increases in costs of raw materials, freights and of manufacture.

The new prices also provide for the charging of a levy on home-produced soluble phosphate fertilisers so that these and the necessary imports to supplement home production can be sold at an averaged price.

The increases in price in Great Britain range from 12½ per cent in the case of sulphate of potash to 82½ per cent in the case of superphosphates.

Copies of The Fertilisers (Prices) Order, 1951, S.I. 1951 No. 1017, can be obtained from H.M. Stationery Office, price 6d.

I.C.I.'s Record Year in 1950

Outlook Good Despite Many Problems

EACH year brings its own special problems but despite the many known difficulties that lie ahead the outlook for 1951 was encouraging said Mr. John Rogers, chairman of Imperial Chemical Industries, Ltd., in his speech at the 24th annual general meeting held in London on 14 June.

After referring to the resignation of Lord McGowan and paying tribute to his personal qualities and leadership, the chairman also mentioned the loss sustained by the company by the retirement of Sir William Coates and the distress caused by the unexpected death of Sir Frederick Bain in his 62nd year.

Turnover for 1950 was a record, consolidated sales at £220 million being more than 20 per cent higher than in the previous year. Although partly due to increased prices, the greater part was attributable to an increase in the volume of business. Exports were 25 per cent more than in 1949 and were running at about £1,000,000 a week during 1950.

Profits not Excessive

Profits were not considered excessive when taking into account the amount necessary to replace manufacturing assets at present-day costs of construction and also the amount of capital needed to finance stocks at current prices.

Revaluation of assets resulted in a large increase in the capital reserves. These reserves at 31 December, 1950, amounted to £118 million as compared with £17 million a year before. It was intended to capitalise a substantial part of these reserves and to make an issue to stockholders of shares credited as fully paid. This would have brought the figures for issued capital more into line with reality.

An application was accordingly made to the Capital Issues Committee for the issue of such shares under a comprehensive scheme. The Treasury, however, declined to give its consent, although no reason for the refusal had been offered.

Expenditure on research and development was now running at about £5.5 million a year. In each successive year a further part of past capital expenditure on new plant came to fruition and it could confidently be expected that there would be a further

expansion of turnover as new capacity came into operation and new products became available for sale.

Turning to the shortage of raw materials which was affecting all British industry, the chairman said that the three materials with which I.C.I. was most concerned were sulphur, non-ferrous metals and benzene.

Sulphur Position

The immediate position regarding sulphur was assured, but there was no margin for expansion and the future was uncertain. Every possibility of using raw materials other than natural sulphur for the manufacture of sulphuric acid was being explored.

Supply of non-ferrous metals had been dominated by stock-piling for rearmament purposes particularly in the United States of America. There were, however, signs that the peak of the demand for stock-piling had been passed, and some gradual improvement in the position might be expected.

Introduction of the 1951 Budget had cast a cloud upon British industry. The raising of the Profits Tax on distributions from 30 per cent to 50 per cent meant that, to pay a 5 per cent gross dividend on any form of share capital, profits of 7.7 per cent on that capital were required, apart altogether from profits which it was prudent to reserve.

One might almost imagine that the budget was framed with the specific object of making it impossible for any progressive company to issue either preference or ordinary capital and of discouraging enterprise.

Serious Interference

There must be considerable sympathy with any steps taken to prevent the avoidance by taxpayers of burdens placed fairly upon them, but the legal avoidance clauses contained in the Finance Bill went much beyond that. In their present form they appeared to cover normal transactions entered into in the ordinary course of business and would seriously hamper the development of the overseas trade of the country. It was to be hoped that the method finally adopted for the prevention of tax evasion would not interfere so seriously with legitimate trading transactions.

HOME

Telephone Number Altered

The Post Office have found it necessary to change the telephone number of the head office and works of Gent & Co., Ltd., to Leicester 36151. This new number comes into operation as from 2 July, 1951.

Housewives Quiz

Mr. Kenneth Horne, sales director of the Triplex Safety Glass Co., Ltd., took the chair at a Housewives' Quiz at the first British Plastics Exhibition and Convention at Olympia on 12 June. Subjects raised included such topics as which plastics are inflammable and the advantages of plastic toys for children.

Refinery Plant Progress

A massive section of the gas separation plant, 170 ft. high and weighing 240 tons, was placed in position last week-end (16/17 June) at the Shell Refinery, Ellesmere Port. It is believed to be the heaviest single lift ever undertaken in the United Kingdom. The plant was made by Babcock & Wilcox, of Renfrew, Scotland, and conveyed in three sections to the refinery where it was welded together, X-rayed, stressed and heat-treated, to ensure that perfection had been attained.

Parliamentary Committee

There will be a meeting of the General Committee of the Parliamentary and Scientific Committee on Tuesday, 26 June, at 5 p.m. in Committee Room 12, when a discussion on 'The Future Development of Higher Technological Education' will be initiated by Dr. Percy Dunsheath, Chairman of Convocation of the University of London and of the London Regional Board for Higher Technological Education, and by Dr. David S. Anderson, A.R.T.C., M.I.Mech.E., Director, Royal Technical College, Glasgow.

New Food Research Station

Problems concerning many types of food will be tackled at the food research centre at Aberdeen which will be opened next month by Mr. Maurice Webb, Minister of Food. Pilot plant has been set up and laboratories are completed in the new building which it is hoped will help to bridge the gap between the purely academic side of food research and commercial practice.

Sulphur Ship on Fire

Fire broke out on board the American ship *Flora C* when she was discharging a cargo of sulphur at Rothesay Dock, Glasgow, on 15 June. Smoke was first noticed coming from No. 2 hatch, and the fire was soon subdued. There have recently been two or three fires on sulphur bearing vessels in the London docks.

Exhibition Successful

Overseas attendance at the First British Plastics Exhibition which finished its 10-day run at Olympia, London, on 16 June, exceeded 1,500, countries represented numbering 35.

A census of exhibitors is said to have shown that over 90 per cent considered that the experiment of holding an exhibition of this kind was completely justified and expressed great satisfaction with the attendance and the nature of the orders and inquiries.

Attendance at the Convention, which ran concurrently with the Exhibition, averaged nearly 300 per session, making a total of 4,316. Largest attendances were at the 'Housewives' Quiz' (510) and at the session on developments in synthetic resins (409).

Titanium Pigment Prices

Sulphur supplies to the titanium pigment industry have now been restored to approximately 90 per cent of the 1950 level. British Titan Products Co., Ltd., is also importing Continental sulphuric acid, thus enabling its plants to operate at full production rate. Consequently, a reduction in the prices of 'Kronos' titanium pigments is now possible, and from 1 July they will be decreased by £7 per ton, making the new basic price of the Rutile type £133 per ton, and of the Anatase type £115 per ton.

Prices of titanium pigments were increased last February for the first time in two years, principally because of increased manufacturing and raw material costs. These increases did, however, provide in part for the effect of lower output caused by the very serious cut in sulphur allocations imposed during the early part of the year.

OVERSEAS

Higher Dividend

France's leading chemical and dyestuff manufacturing company, the Etablissements Kuhlmann, declared a gross dividend of 110 francs (80 francs last year) equal to 11 (10) per cent gross on the capital which was increased during the last financial year from 2,196 to 2,745 million francs.

Argentinian Source of ACTH

Large quantities of fresh pancreas and pituitary in the Argentinian livestock herds are being exploited by a four-story building that has been erected in the Argentine by Armour & Co., of Chicago, for the production of insulin, trypsin and ACTH. Insulin requirements in the world double every six years, and many diabetics died during the war when bombing destroyed supplies. Argentinian needs for the three drugs, estimated at 20 per cent of the capacity, will be satisfied first, leaving 80 per cent for worldwide distribution.

Cheaper Norwegian Hydrogen

Norsk Hydro is spending £1,000,000 on installing a cheaper process for production of hydrogen for its nitrogen fixation plants. Norsk obtains hydrogen for ammonia synthesis by electrolysis, and the new method is reported to raise the output of hydrogen per kWh by 25 per cent. The new process is being installed at its synthetic ammonia plants at Glomsfjord and Heroya, and will add about 9,000 long tons of fixed nitrogen per year to Norsk's production.

Portable Water Filter

An American, Alexander Goetz, has invented and developed a water filter that may be the answer to the water problem for isolated troops in contaminated country. Composed of a filter which strains the coarser algae and foreign matter, its main adsorbent is colloidal carbon containing traces of silver and an insoluble alkali peroxide. Placed on the filter, the powdered carbon forms a cake on contact with the water which renders all foreign matter inert, and filters some of it. The bacteria remaining are no longer harmful. The filter has been found to reduce the bacteria count of raw sewage from 2,500,000 per c.c. to zero, and can supply 50-100 men with sanitary water inside 20 minutes.

Decontamination at Oak Ridge

A simple, inexpensive process for decontaminating liquids—part of the problem of waste disposal in laboratories using radioactive material—has been developed recently by scientists working at the Oak Ridge National Laboratory in America. In the process, liquid contaminated by nuclear fission products or other radioisotopes is passed through a column or series of columns containing a filter arrangement of steel wool, clay, activated carbon, an anion exchange, and a cation exchange resin. An interim development report of the inventors is available on request to the director, Oak Ridge National Laboratory, Box P, Oak Ridge, Tenn., U.S.A.

To Develop Sulphur

The President of Brazil, Dr. Vargas, has recently approved plans drawn up by the Minister of Finance envisaging the development of a Brazilian sulphur industry to be based on the utilisation of the pyrite reserves (estimated at 500,000 tons) of the Cia. Siderurgica Nacional at Tubarao in the State of Santa Catarina. The Minister is reported to have pointed out that Brazil's annual sulphur requirements were about 70,000 tons, compared with 45,000 tons which are, at present, being received from the U.S. He suggested, furthermore, that a new corporation, one half of which would be owned by the Cia. Siderurgica Nacional and the other half by private interests, should be formed to develop the pyrite deposits.

Austrian Sulphuric Acid

The Gailitz, Carylthia, sulphuric acid plant of the Bleiberg Mining Union, Ltd., the first plant for the manufacture of this indispensable chemical product in Austria, is reported to be nearly completed. It will go on steam in the near future at one-half of the full capacity of 30,000 tons p.a. Carylthian lead and zinc ores which have a high sulphur content, will be used as raw material.

A second sulphuric acid plant, with an annual capacity of 40,000 tons, is being planned by the Nitrogen Works, Ltd., Linz, Upper Austria, to use anhydrite.

Chemistry & Electricity

Development Linked with Electrification

THE chairman of the North Eastern Electricity Board, Mr. H. H. Mullens, B.Sc., read a paper entitled 'Electricity as a National Asset' on 20 June at Brighton at the third British Electrical Power Convention. He referred to a number of industries in which the efficiency and output had been greatly increased by means of electrification.

In regard to the chemical industry, he said that expansion and development had been closely linked with an extended use of electricity and modern chemical works were among the largest users of electricity. In one chemical works, of which he had some knowledge, the total horsepower of the electric motors installed exceeded 200,000.

Electrolytic Processes

While electricity was used extensively in the chemical industry for motive power where its applications were those common to industry in general—namely, pumping, compressing and the handling of material—it was vital to electrolytic processes. One of the best known and most important of these was the treatment of brine to form caustic soda, chlorine and hydrogen. All commercially produced chlorine was made electrolytically for which there was, in fact, no practicable alternative process. The electrolytic reduction of caustic soda to form sodium metal was also of prime importance at the present time. Other electro-chemical processes, in which large quantities of electricity were used, were the manufacture of aluminium and magnesium.

The present trend in the development of the chemical industry, said Mr. Mullens, was towards the grouping on one site of a number of chemically interdependent processes. Many of these required large quantities of low pressure and intermediate pressure steam, and it was because of this that it was usually found more economical to produce high pressure steam at a central power station on the works site, the steam being reduced through back pressure or pass out turbines driving alternators before being used in the chemical processes. It was extremely difficult for a perfect heat balance to be maintained within an individual works of this type and yet, by some means, a heat balance must be maintained if waste of precious fuel was to be avoided.

The best answer was the interconnection of the private power stations at these works and the public electricity supply system, thus enabling interchanges of electricity to take place.

PERSONAL

MR. G. BASSETT-DAY, M.P.S., M.S.M.A., has been appointed a director of Calfos, Ltd. Mr. Day has been sales manager of Calfos, Ltd., for the past five years.

MR. CALEB HERITAGE PERCY BUNE, Knutsford, retired metallurgist, left £12,481, net £12,427.

MR. FREDERICK CHARLES FAIRHOLME, Beaconsfield, Bucks., formerly associated with Cammell, Laird & Co., Ltd., and chairman of the Firth-Brearley Stainless Syndicate, Ltd., and who was closely connected with the development of stainless steel in this country, left £36,119, net £33,241.

MR. F. SCOTT and Mr. J. J. JONES were recipients of gold watches for 30 years' service with the I.C.I. at Runcorn, and MR. J. NORTON received a silver watch for 20 years' service. The presentations were made at the Randle Works on 13 June.

Staff and students of the City College of Technology, Liverpool, said goodbye on 12 June to MR. A. E. FINDLEY on his retirement as Head of the Department of Chemistry and Biology. Mr. Findley, who is 65, had been with the College for 31 years. He was presented with an arm-chair by MR. R. R. BUTLER (Principal). Mr. Butler said that Mr. Findley had helped to convert what was a technical school into one of the foremost institutes of its kind in the country. Among others present who added their tributes were his successor, DR. F. J. SMITH, and PROFESSOR T. P. HILDITCH, F.R.S., who holds the Chair in Industrial Chemistry at Liverpool University.

MR. CHARLES HOPE LUMLEY, O.B.E., has been appointed director of home sales (industrial) of Sigmund Pumps, Ltd. Mr. Lumley was, throughout the last war, Regional Controller of the North of England for the Ministry of Supply. Since the end of the war, he has held, under the Foreign Office, the office of Economic Controller, Hamburg.

The Chemist's Bookshelf

STRUCTURAL CHEMISTRY OF INORGANIC COMPOUNDS. Volume I. W. Hückel: Translated by L. H. Long. Elsevier Publishing Co., Ltd. Distributors: Cleaver-Hume Press, London. 1950. Pp. xii + 437. Figs. 50. 70s.

The original work, of the first part of which this volume is a translation, appeared in Germany about 1947. The present translation has been brought up to date where this has been thought necessary through the appearance of new material in the literature. Otherwise, the translator claims, a fairly rigorous translation has been attempted.

Professor Hückel's aim has been to attempt to present for the benefit of inorganic chemists a combined structural and constitutional theory such as that which has allowed so much systematisation in the field of organic chemistry. No one with any knowledge of the state of modern inorganic chemistry will disagree with the contention that such an all-embracing theory would be of the utmost value. Not only would it help the student of the subject, who still complains about the masses of uncorrelated information which has to be absorbed, but it would also be of extreme value to future research workers in indicating useful lines of probable advance. However, without further information about the contents of Volume II of the English translation than is available in the abbreviated Table of Contents appended to the present volume, it is quite impossible to judge to what extent the author has achieved his aim.

The volume comprises Book I, Stoichiometry and Systematisation; and Book II, Atomic Structure and Chemical Bonding. Book I gives a quite detailed historical review of the growth of ideas about chemical combination, particularly as they apply to inorganic compounds, leading up to Werner's work on co-ordination compounds. It emphasises the way in which stereochemical problems differ in the organic and inorganic fields, and concludes with an

extensive classification and review of the various types of complex compounds and the relations between them.

In Book II we are led by way of the periodic classification to a knowledge of atomic structure, and thence to a detailed discussion of the ways in which chemical bonds have been investigated and the nature of the various types of bonds.

The whole tendency is to stress the fact that constitutional factors play an equally important part to that played by the periodic properties of the elements, and that, in other words, a 'molecular' as well as an 'atomic' view must be taken, in order to obtain a properly comprehensive view of inorganic chemistry.

At this stage it would be unfair to criticise in any way the selection of material here presented, since many of the obvious gaps will undoubtedly be covered in the second volume. It must be said, however, that the desire of the translator to give a faithful presentation in English of Professor Hückel's original work has unfortunately led him from time to time to use awkward expressions and words of doubtful derivation; and frequently to present ambiguous statements. The true meaning of some of the ambiguities is, of course, self-evident. But in too many of them the average chemical reader will not be able, without a good deal of thought or further reading, to decide which of two, or indeed sometimes of three, possible interpretations is the correct one. A rather stilted Germanic flavour persists throughout the work. It is therefore all the more startling, on a rare occasion, to come across a slang phrase such as 'this does not come off'.

It is probable that the lack of index in this volume is the result of the time-lag between the appearance of the two volumes. But it is the firm conviction of the reviewer that a complete subject index should be given, no matter at what sacrifice, in each volume of any multi-volume work. It is not so vital to duplicate the author-index, as this will not be consulted so frequently.—C.L.W.

REVIEWS OF PETROLEUM TECHNOLOGY, Vol.

10. Edited by F. H. Garner, E. B. Evans, and G. Sell. The Institute of Petroleum. London, 1951. Pp. 350. 27s. 6d.

In this survey of the petroleum scene in the year 1948 there are over 2,000 references to articles and patent specifications, but even so this was not a vintage year, and subsequent volumes will probably be larger. The subjects covered are surprisingly diverse and include such queer neighbours as geology and aircraft engineering. Only a few of the chapters will be of interest to chemists and these will be briefly described.

'The Chemical and Physical Refining of Petroleum' by F. Morton contains an abstract of the work carried out on the sweetening and desulphurisation of petroleum and also a report on the chemical dehydration of petroleum. The same author has contributed the next chapter which deals with cracking and other processes, and this review covers the years 1947-8. New processes and experimental work are described and also the design and location of cracking units. The catalysts and yields are discussed. Among the other processes mentioned are alkylation, isomerisation, hydroforming, catalytic reforming and polyforming, polymerisation and hydrogenation.

A chapter on the 'Chemistry and Physics of Petroleum' has been written jointly by J. H. T. Brook, A. D. Shellard and R. B. Whyte. The chemical reaction of hydrocarbons are discussed and the topics under review include the oxidation, isomerisation and pyrolysis of hydrocarbons, aspects of combustion of hydrocarbons (including the propagation of flame), burning velocity, and inflammability limits. The surface properties of oil-water films are discussed, the surface tension usually being measured by the sessile drop method. Force area curves of films of fatty acids and alcohols have been studied and the molecular cross-section areas deduced.

Advances in the analysis and testing of petroleum products have been reviewed by J. Scott in a rather short chapter of 13 pages. The author here describes methods of analysis for all types of materials from gasoline to bitumen. The methods given for gasoline range from the simple tests of specific gravity and distillation to the more complex procedures of hydrocarbon analy-

sis. Optical methods such as spectrometry and refractrometry are briefly mentioned, the most surprising being the use of the mass spectrograph.

The chapter dealing with chemicals derived from petroleum has been contributed by R. S. Airs, and contains information upon a variety of substances such as butadiene, acetaldehyde and glyoxal, etc. It was of interest to read of the large synthetic glycerine plant at Houston which produces glycerine of high purity by the high temperature chlorination of propylene. Other topics dealt with include carbon black, plastics, synthetic rubbers and wetting agents.

C. C. Hall has contributed an account of the development of the Fischer-Tropsch process in a chapter on the hydrogenation of coal, while succeeding chapters deal with low and medium temperature carbonisation processes and the production of benzole from coal. The last mentioned section contains information upon benzole recovery and refining and the analysis of benzole fractions. The topic of benzene poisoning is mentioned and there is a reference to the excellent book dealing with that subject.—J.R.M.

Cobalt Metal Duty

THE Board of Trade have announced that they have under consideration a proposal that the existing Customs and Excise Tariff Exemption Heading, Group VII (9) should be amended to read:—

'Cobalt metal, unwrought, but not including alloys of cobalt.'

This proposal arises out of an application received by the Board of Trade for the addition to the Free List under the Import Duties Act, 1932, of cobalt metal in shapes not covered by the terms of the existing Tariff Exemption Heading relating to certain forms of unwrought cobalt and which are at present liable to the 10 per cent general *ad valorem* duty.

Any representations which interested parties may desire to make in regard to this proposal should be addressed to the Board of Trade, Industries and Manufactures Department, Division 1B, Thames House North, Millbank, S.W.1, not later than 6 July, 1951.

Publications & Announcements

KESTNER Evaporator & Engineering Co. have just issued a new brochure, No. 285 on their patent isoelectric heating system. The brochure describes, with photographs, the method of heating, the control gear, instrument panel, control circuits, and full details of performance, applications and so forth. The company claim that their system has high efficiency, rapid heating but not overheating, accurate temperature control, low power requirement, low maintenance and perfect safety.

* * *

AFTER ten years' idleness, due to shortage of foundry coke, the unique carbon dioxide plant of T. Wall & Sons, Ltd., has resumed production.

The plant, German-built and first of its kind in Britain, produces dry ice for ice-cream refrigeration. Five absorbing towers, 90 ft. high, have been refilled with coke and the entire plant has been overhauled by Mr. R. Northover, Wall's chief engineer, prior to refilling of the towers by Black (Installations), Ltd., of Ealing. Each tower holds about 80 tons of coke. Refilling was necessarily a long and tedious operation for which a skip-hoist crane was fixed to the top of the towers.

These huge towers rely for stability upon their weight; there are no deep foundations or guy-ropes holding them erect.

It is expected that the renovated plant will go far towards fulfilling the dry ice requirements of Wall's three factories—at London, Manchester and Edinburgh—and those of the numerous supply depots throughout England, Scotland, Wales and Northern Ireland.

* * *

A NEW design multi-motor control board for heavy industrial use, known as the Type 948 'Unibord' has been introduced by Brookhirst Switchgear, Ltd. It is a unit-built board from fully-tooled standard assemblies, all of which are of the same width and interchangeable. Basically it comprises self-contained, self-supporting frameworks of bolted angle-iron construction which accommodate cast iron unit busbar chambers and unit contactor-type starting equipments. The latter can be mounted one above the other on the framework sup-

ports. Up to six of the smallest size starter cases can be coupled to a single centrally disposed busbar chamber unit (three above and three below) all on one framework unit. The starters are standard Brookhirst Type SC straight-on starters for horsepowers up to 200 H.P. 400/440 V. They comprise contactors, thermal or solenoid overload tripping relays, h.r.c. main fuses, isolators, etc., and have provision for local and remote two- or three-wire control, sequence interlocking, and entry for all classes of paper or rubber insulated cables.

* * *

ALL kinds of safety goggles, helmets, respirators, and gloves for any purpose where danger to the eyes, hands, face or lungs is present, are described in a small brochure published by J. & R. Fleming, Ltd. In an article entitled 'Safety First!' the company quotes the statutory Rules and Orders for Factories (1938), No. 654, which decrees that efficient eye protection shall be given to workers in industry in certain cases. Many types of lens or protector are described made from either glass or plastic material, and of various colours to give filter protection in the case of harmful radiation. Respirators cover a wide range of designs and functions, from ordinary nuisance dust protectors to lead dust and paint spray respirators. A price list is included at the back of the pamphlet, which can be obtained from 146 Clerkenwell Road, London, E.C.1.

* * *

SHOWN for the first time at this year's BIF was Doulton & Co.'s new large capacity high-pressure industrial filter, Model No. F.92. This filter provides a large area of filter surface (roughly 3,400 sq. in.), thus minimising the operating pressure required to achieve high rates of fluid flow, and minimising also the flow-reducing effect of the filter cake. The latter is still further counteracted by the provision made for accumulation and removal through a sludge door of solid material far in excess of that met with in normal water filtration. To describe this filter in detail and give its specifications, Doulton & Co. have brought out a small pamphlet which may now be obtained from them on application.

THE British Coal Utilisation Research Association has recently issued its 12th number of the BCURA Quarterly Gazette, in which are articles dealing with the training of technologists, recent lectures by the staff, zircon refractories, and an interesting article on domestic heating and the relative efficiency of various types of fire or stove. This latter article is, says the Association, the first of a series of descriptive articles on some of the essential technical facts about the uses of coal, which will endeavour to 'get across' to users of fuel the importance of knowing what results they are getting.

LINK-BELT Company, Chicago, announces that it has developed and now has in production a new conveyor of oscillating trough type, called Link-Belt Flexmount, for the handling of a great variety of loose bulk materials at moderate capacities. The company states that the conveyor construction is ideal for handling foodstuffs, chemicals and other material where cleanliness, contamination or corrosion is a factor, and that very hot, sharp, jagged or oily material, such as steel chips and turnings, are handled with virtually no wear of metal troughing. Escape of dust or gases can be eliminated by the addition of a metal cover with flexible connections at loading and discharge points. The Flexmount design features the use of a one-piece metal trough with high sides, supported on simple one-piece flexible members which function as springs in absorbing the energy of the trough movement at each end of the stroke. Conveyor trough is normally 4 in. deep and can be furnished in standard widths of 8 to 24 in., made of No. 10 or 12 gauge steel, stainless or corrosion-resistant steel, or other special material. Motion is imparted to the trough by a roller-bearing, constant-stroke eccentric.

PETROCHEMICALS, Ltd., have recently brought out the second in a series of Technical Service Leaflets, on the handling and storage of ethylene oxide. Describing the physical, chemical and other properties of ethylene oxide, the makers say that although it is inflammable, explosive when mixed with air, and very reactive, as well as being mildly toxic, it can be used with complete safety provided their recommendations are adhered to. Methods of detecting ethylene oxide in air are given, as well as precautions for

handling it or dealing with accidents should they occur. Copies of the pamphlet may be obtained from the firm's sales department, 170 Piccadilly, London, W.1.

A BROCHURE on rotary air and water extraction pumps has been issued by Drysdale & Co., Ltd., of Glasgow. It contains for the first time in combined form, details of the firm's three patent design multi-purpose pumps—the 'Aquair' rotary vacuum pump, the 'Clyvac' Air and Water Extraction Pump, and the 'Vampire' Air and Condensate Extraction Pump. Drysdale & Co. manufacture all classes of centrifugal and rotary pumps, and this brochure illustrates the design and applications of these three latest products.

THE Thermal Syndicate have just announced the publication of their first illustrated catalogue dealing with Vitreosil Laboratory Ware since before the war. They have also issued a revised version of their handbook on fused quartz and silica—'About Vitreosil'—which now contains details of the methods which can be employed for the working of fused silica. Their catalogue contains an impressive array of transparent or translucent basins, bottles, retorts, etc., as well as specialised equipment for various different analyses, testing of materials, determinations and so on. At the beginning are two pages of information about Vitreosil and the way it should be treated. The catalogue is well printed and handsome in appearance.

A NEW book containing concise and detailed information on vanadium steels and irons for the use of metallurgists and designing engineers has been issued, and is available free of charge, by the Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N.Y. The 80-page book brings together publication data on 180 different compositions of steel and iron containing vanadium, and contains in tabulated form information on the composition, heat treatment, properties and typical uses of vanadium light and heavy wrought constructional steels, spring steels, plate and sheet steels, tool steels, cast and alloyed steels. The data will be of considerable value to those interested in the production, fabrication and use of ferrous metals.



THE "Nivoc" Filter Pump (registered design No. 859868) is the outcome of a series of experiments made in our laboratories on a wide range of materials for the pump body, and with many types of design. The final design is extremely efficient and highly resistant to the severe conditions encountered in most chemical laboratories.

The pump is particularly efficient at low water pressure, a vacuum of 12 mm. of mercury being easily obtainable at 12-15 lb. per sq. in. This characteristic eliminates pump-back under widely fluctuating water pressure.

Nivoc Filter Pump. Catalogue No. ND.211 (for attaching with rubber tube to standard laboratory taps). **each 8s. 6d.**

An alternative fitting for B.S.P. $\frac{1}{2}$ in. thread is described in leaflet P. 1919.

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W44

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

A. & W. CHEMICAL CO., LTD., London, W. (M., 23/6/51). 13 April, £650 Land Registry charge, to J. A. Peters, Guildford, and another and £1,500 debenture, to Contango Banking & Trading Co., Ltd.; respectively charged on 1 and 2 Cricketers Ct., Lower Kennington Lane, Lambeth, and a general charge. *£650. 12 January, 1951.

NORMAN SINCLAIR (WOODWORKING), LTD., London, W. (M., 23/6/51). 13 April, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 65 Castlebar Road, Ealing. *Nil. 14 June, 1950.

SOLARTRON LABORATORY INSTRUMENTS, LTD., Kingston-on-Thames. (M., 23/6/51). 14 April, £500 debentures, part of a series already registered. *£5,260. 24 October, 1950.

THERMAL SYNDICATE, LTD., Wallsend. (M., 23/6/51). 11 April, £10,000 debentures, part of a series already registered. *£20,000. 14 April, 1950.

TIMOTHY WHITES & TAYLORS, LTD., Leeds, chemists. 10 April, substituted security, supplemental to a Trust Deed dated 14 July, 1947; charged on specified properties at Camberley, Farnham, Gravesend, Newport (I.o.W.), Northolt Park, Reading, Wallington and Worthing. *£1,414,360. 27 July, 1950.

TINTOMETER, LTD., Salisbury, instrument manufacturers. (M., 23/6/51). 9 April, £1,900 debenture, to Salisbury Property Co., Ltd.; general charge. *£1,900. 16 June, 1950.

Satisfactions

A. & W. CHEMICAL CO., LTD., London, W. (M.S., 23/6/1951). Satisfaction, 13 April, of debenture registered 21 February, 1950.

INSULATION MANUFACTURING CO. (PLAS-

TICS), LTD., Glastonbury. (M.S., 23/6/51). Satisfaction, 14 April, that property (show-room offices, etc., at corner of Northload Street, and George Street, Glastonbury), comprised in a mortgage and charge registered 5 October, 1948, has been released from the charge.

SEVERN BRIDGE FERTILISERS, LTD., (formerly ORGAHUME, LTD.), Worcester. (M.S., 23/6/51). Satisfaction, 18 April, of mortgage securing all moneys, etc., registered 18 December, 1944.

WINTONS (CHEMISTS), LTD., Bromley (Kent). (M.S., 23/6/51). Satisfaction, 16 April, of mortgage registered 2 March, 1950.

New Registration

Luminisers, Ltd.

Private company. (28,395). Capital £10,000. To deal with radium and radium products, etc. Directors: J. A. Kelly, R. G. Fordyce, T. J. Gearing and J. A. Lumsden. Reg. office: 169 West George Street, Glasgow.

Increases of Capital

The following increases of capital have been announced: BOTTLING TRADES CHEMICAL CO., LTD., from £5,000 to £15,000; HERCULES POWDER CO., LTD., from £20,000 to £260,000.

The following increases of capital have been announced: F. HAWORTH (A.R.C.), LTD., from £500 to £10,000; TRANSPORT & CHEMICAL EQUIPMENT, LTD., from £1,000 to £15,000.

The following increases of capital have been announced: ELLIS RESEARCH & TESTING LABORATORIES, LTD., from £2,000 to £3,000.

METALLURGICAL CHEMISTS, LTD., from £7,000 to £25,000.

Successful Tests

Successful tests under full-load conditions have been made at the new 80-in. continuous hot strip mill at the Abbey Works, Port Talbot, Australia, and it is ready to go into production. The cold reduction plant for making steel sheets at Margam (Port Talbot) is expected to start later.

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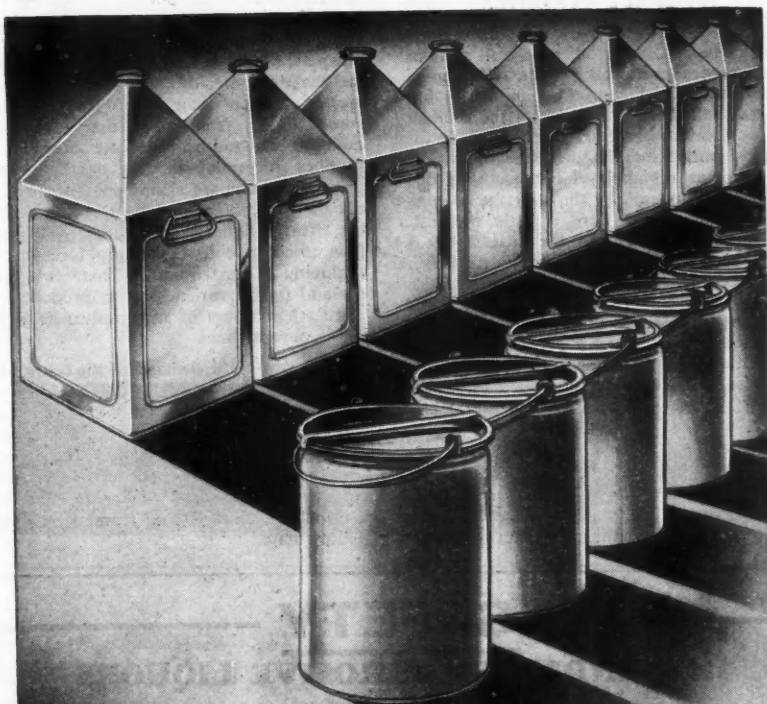
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Market Reports

LONDON.—Strong price conditions continue to be reported from nearly all sections of the general chemicals market. The movement to the chief consuming industries has covered substantial volumes but the difficult supply position has been the limiting factor in new business. The demand for export continues at a high level but much of this business is hindered by the shortage of suitable containers. There is little of fresh importance to record in the coal tar products and the demand generally continues to exceed the quantities coming on the market. Exports of cresylic acid have again been good and there has been a steady call for pitch. The prices for phenol and cresol are to be increased at the beginning of July.

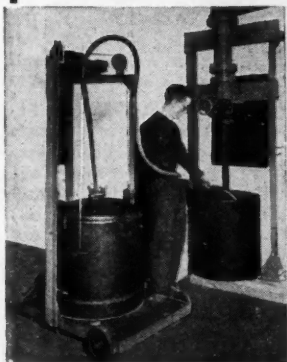
Under the Benzole and Allied Products Control Order, benzole increases vary from $\frac{1}{2}$ d. to $2\frac{1}{2}$ d. a gallon; coal tar naphthas from $2\frac{1}{2}$ d. to 3d. per gallon; xylols from $5\frac{1}{2}$ d. to 6d. and toluols from $1\frac{1}{2}$ d. to $3\frac{1}{2}$ d. Motor benzole is unaffected.

MANCHESTER.—In almost all sections of the Manchester chemical market a brisk

demand has been reported during the past week, but in a number of lines difficulty is being experienced by consumers in securing adequate supplies and present indications are that in some instances the position will worsen rather than improve. Delivery specifications from home users are circulating freely and shippers are pressing for supplies due under existing orders. Firm price conditions are again reported throughout the market. It remains to be seen what the effect will be of the sharp rise in fertiliser prices due to come into force at the beginning of next month. There is a brisk demand for all varieties of tar products and there are rumours of sharp advances pending in several lines.

GLASGOW.—The demand of the last month or so has been steadily maintained and all branches of the trade are extremely busy. Supplies are, with a few exceptions, a little easier and generally speaking the overall position is sound. The call for materials for export continues to be brisk and the position is unchanged and remains in a very healthy state.

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The OLDBURY PATENT SAFETY CARBOY DISCHARGER

will empty the contents of any carboy, bottle or vessel and complies with the conditions of the Factory Act, 1937.

It eliminates all risk of breakage and spilling. Ensures the safety of the operator. It is also the quickest way of elevating the contents of a carboy, etc., up to a height of 40 feet.

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The MSE "MEDIUM" CENTRIFUGE is a general-purpose centrifuge for both day-to-day and specialised laboratory work. It has a maximum capacity of 1,000 ml. when using bottles or jars in slotted cups, and 600 ml. with glass tubes in metal buckets, and can take up to 64 small glass tubes in multiple carriers. A useful choice of interchangeable "Swing-out" and "Angle" heads, a Superspeed Unit, continuous action "Basket" Heads and a wide range of adaptors and other accessories make the MSE "Medium" Centrifuge an extremely versatile machine.



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CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

HIS MAJESTY'S COLONIAL SERVICE, MALAYA
A BIOCHEMIST is required to carry out research and other routine work in the Institute of Medical Research, Federation of Malaya. The post is pensionable but the officer will be on agreement for three years in the first instance. Salary according to qualifications and experience in scale £700—£1,652 including pensionable expatriation allowance. Cost of Living Allowance of between £336 and £707 according to salary and family commitments is also payable. Government quarters and heavy furniture, if available, are provided at nominal rent. Officers occupying private quarters may be granted an assistance allowance towards rent. Income Tax at local rates which are much lower than in United Kingdom. Free first class passages for the officer, his wife and children under age of ten, not exceeding four persons besides himself, once each way during each tour of service. Leave at the rate of 45 days for each year of resident service. Free medical attention for officer, wife and children, but a charge is made for hospital maintenance. Candidates, who should be under 35, should possess a British Honours degree in Chemistry or equivalent qualification plus at least one year's approved post-graduate Biochemistry experience. A Ph.D. in organic chemistry or equivalent post-graduate research is desirable. Application should be made, giving brief particulars of qualifications and experience to the **Director of Recruitment (Colonial Service), 2, Sanctuary Buildings, Great Smith Street, London, S.W.1.** quoting reference 27106/49/51.

ASSISTANT EXPERIMENTAL OFFICERS (including biologists) in various Government Departments. The Civil Service Commissioners invite applications for permanent appointments. Interviews will be held shortly after the receipt of the completed application form and successful candidates may expect early appointments. The posts are in various Government Departments and divided between following main groups and subjects (a) Mathematical and Physical Sciences, (b) Chemistry and Metallurgy, (c) Engineering Subjects and (d) Miscellaneous (including e.g. Geology, Library and Technical Information Services). A few vacancies have now arisen for biologists interested in pest infestation control, forensic science or fisheries problems, and there may be one or two posts for biologists with other interests.

Candidates must be at least 17½ years and under 26 years of age (or under 31 for established Civil Servants of the Assistant (Scientific) Class) on 1st August, 1950; time spent on a regular engagement in H.M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with mathematics or a science subject as a principal subject, or an equivalent qualification; but candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London salary scale (men) is £250—£535; (women) £250—£445. Salaries for posts in the provinces are somewhat lower. Superannuation provision is made under the Superannuation Act.

Further particulars and forms of application from the Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1., quoting No. 3068. Completed application forms should be returned as soon as possible and must in any case be received not later than 1st October, 1951. M1722/150/WP.

CHEMIST or CHEMICAL ENGINEER with works experience required for the design and development of glass Chemical Plant. Duties will include co-operation with customers on matters of design, erection and operation, as well as carrying out design and development work in the factory. Apply **Technical Director, Quickfit & Quartz Ltd., Stone, Staffs.**

SITUATIONS VACANT

CHEMICAL ENGINEERS. Applications invited from men under 30 years of age to work in important industrial organisation in SOUTH AMERICA. Graduate engineers who have obtained B.Sc. or equivalent required for junior positions on sugar estates. Salary 2,000 Peruvian soles per month plus monthly foreign remittance of \$100 per month and free accommodation. Reply giving details age, experience, whether married, etc., to Box X 180, c/o Jacksons, 16, Gracechurch Street, E.C.3.

DEVELOPMENT GROUP MANAGER required by the Division of Atomic Energy (Production) Ministry of Supply Factory, Capenhurst, Nr. Chester, to take charge of an applied research and development laboratory engaged on special development work for a new atomic energy project.

Candidates must either have a good honours degree in chemistry, physical chemistry or physics, associateship of the Royal Institute of Chemistry, or the Institute of Physics or equivalent qualifications. They must have had several years research and development experience and preferably have had experience in either physics, inorganic chemistry, kinetic theory, thermodynamics or vacuum techniques.

Salary will be assessed according to qualifications and experience within the range £907—£1,192 p.a. A house will be available within a reasonable period for the successful candidate if married. Voluntary contributory superannuation scheme. Applications to Ministry of Supply, D.At.En.(P), Risley, Nr. Warrington, Lancs. Rs. 7052-DR-25-(29.5.51).

FULLY QUALIFIED ENGINEER required for the control of a large design office in London by an Anglo-American engineering firm engaged upon the design and construction of large chemical plants in the United Kingdom and Europe. Applicants must have had extensive drawing office experience in the co-ordination of mechanical, electrical and civil engineering work. A knowledge of chemical engineering is desirable. B.Sc., degree or equivalent essential, and full membership of appropriate Professional Institution desirable.

The post offers scope for considerable further advancement and the starting salary will depend upon qualifications and experience. Write, in confidence, giving details of education, qualifications, experience, age and present salary to Box No. 67, c/o Browns, 37, Tothill Street, S.W.1.

THE Division of Atomic Energy (Production) invites applications for the post of **CHEMIST I** in the production planning section at Risley headquarters. This section is concerned with the control of manufacturing programmes at three large factories situated at Salwick, Nr. Preston; Sellafield, Cumberland and Capenhurst, Nr. Chester.

The work will involve the planning of inter-related factory programmes, the investigation of the economical investment of fissile materials, consideration of the many technical aspects of various processes and development studies, and the ability to appreciate a large field of new chemical processes and think from first principles.

Candidates must have either a good honours degree in chemistry, associateship of the Royal Institute of Chemistry or equivalent qualifications. They should have had development and, preferably, industrial experience.

Salary will be assessed according to qualifications and experience within the range £907—£1,192 p.a. A house will be available within a reasonable period for the successful candidate, if married. Voluntary contributory superannuation scheme. Applications to Ministry of Supply, D.At.En.(P), Risley, Nr. Warrington, Lancs. Rs. 7059-DR-25-(30.5.51).

SITUATIONS VACANT

THE Civil Service Commissioners give notice that an Open Competition for pensionable appointment to the **ASSISTANT (SCIENTIFIC) CLASS (BASIC GRADE)** will be held during 1951. Interviews will be held throughout the year, but a closing date for the receipt of applications earlier than December, 1951 may eventually be announced either for the competition as a whole or in one or more subjects. Successful candidates may expect early appointments.

Candidates must be at least 17½ and under 26 years of age on 1st January 1951, with extension for regular service in H.M. Forces, but other candidates over 26 with specialized experience may be admitted.

All candidates must produce evidence of having reached a prescribed standard of education, particularly in a science subject and of thorough experience in the duties of the class gained by service in a Government Department or other civilian scientific establishment or in technical branches of the Forces, covering a minimum of two years in one of the following groups of scientific subjects:-

- (i) Engineering and physical sciences.
- (ii) Chemistry, bio-chemistry and metallurgy.
- (iii) Biological Sciences.
- (iv) General (including geology, meteorology, general work ranging over two or more groups (i) to (iii) and highly skilled work in laboratory crafts such as glass-blowing).

Salary according to age up to 25—Men £215 (at 18) to £230 (at 25)—£455; rather less in the provinces and for women. Opportunities for promotion.

Further particulars and application forms from, **Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1.,** quoting No. 559/51. Completed application forms should be returned as soon as possible. 10673/300/J.C.

THE Civil Service Commissioners invite application for permanent appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER** to be filled by competitive interview during 1951. Interviews began in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1951 may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of fundamental and applied science. Candidates must have obtained a university degree with first or second class honours in a scientific subject (including engineering) or in Mathematics, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience. Candidates for Scientific Officer posts taking their degree in 1951 may be admitted to compete before the result of their degree examination is known.

Age Limits: For Senior Scientific Officers, at least 26 and under 31 on 1st August, 1951; for Scientific Officers, at least 21 and under 28 (or under 31 for established civil servants of the Experimental Officer class) on 1st August, 1951. Salary Scales for men in London Senior Scientific Officers, £700 by 25—£900; Scientific Officers £400 by 25—£650. Rates for women are somewhat lower.

Further particulars from the **Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1.,** quoting No. 559/51. 10224/250/M.L.B.

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VARIOUS MIXERS FOR SALE

BAND CONVEYOR, 50 ft. long 40 in. wide, steel frame motorised, for boxes, cases, bags, etc.

Two **FILTER PRESSES** fitted with wood plates and frames, washing type.

Two **FILTER PRESSES**, chamber type, steam heated, centre fed with separate outlet taps.
14 various open top **STORAGE TANKS**, riveted/capacities from 300 gallons to 9,300 gallons, last used for oil or varnish.

1½, 2½ and 3½ size belt-driven **DISINTEGRATORS** by Christy & Norris or Harrison Carter.

Size No. 3 Junior Hammamac **HAMMER MILL** with fan and cyclone, also No. 1 size **Miracle GRINDING MILLS** and one size **3W Miracle GRINDING MILL**.

Robinson 3-sheet No. 1 size **CENTRIFUGAL DRESSING MACHINE** for dry powders, etc.

Gardner Size "G" **RAPID SIFTER** and **MIXER**, belt and gear driven.

Two Gardner **RAPID MIXERS** only, 40 in. long, 14 in. wide, one provided with small separate A.C. Motor.

Four **ROTARY BOWL MIXERS**, 5 ft. diam., cast iron built, inclined agitators, by Baker Perkins.

One Broadbent under-driven **HYDRO EXTRACTOR** self-balancing type, with self-contained A.C. motor.

Two **FILTER PRESSES**, fitted recessed C.I. plates, 40 in square, 2½ in. thick, centre fed, to make 11 cakes per Press.

Kek **GRINDING MILL**, square pin type, with grinding discs 13 in. diam., including circular delivery bin with single outlet.

Large unjacketed **WERNER MIXER**, belt and gear driven, hand tipping, double "Z" arms, pans 53 in. by 45 in. by 36 in. deep.

No. 200 One nearly new **WERNER FLEIDERER JACKETED MIXER OR INCORPORATOR**. Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gear covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER**, steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two B.S.J. running from end to end.

Further details and prices upon application

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- 2 **ELECTROSTATIC PRECIPITATION PLANTS** by Siemens Lurgi Cottrell, each with twin insulated collecting chambers containing Electrodes and Shaking gear. Chamber dims. 62 ft. 6 in. high overall by 11 ft. 9 in. by 10 ft. Complete, with Fan, Cyclone and Dust Collector, and 20-kV.A. Transformer.

JAR & BOTTLE CAPPER by Gravill. Cap. approx. 36 per min. with adjustment for various sizes. Motorized 220/240/1/50, through reduction gear. Unit mounted on C.I. stand with castor wheels.

BOTTLE RINSING M/C by Thomas & Hill. Chain conveyor type, 12 ft. centres, double row bottle fixtures 132 head. Rotary jet rinsing. Cap. 150 dozen half or pint bottles per hour. Motorized 400/3/50.

LABELLING M/C by Rawsons, for pint or 16 oz. size or flat or square. Cap. 24-30 per min. Numbering device. Motorized 400/3/50. Unit mounted on rubber tyred wheels.

5 **ELECTRIC MAGNETIC SEPARATORS** by H. G. Richardson. Reco type No. D.83. 180V. 1 amp. Carton **FILLING, PACKING, WRAPPING & LABELLING MACHINE** by Societe Industrielle Suisse, adjustable for cartons from 73 mm. sq. by 38 mm. to 65.6 mm. sq. by 38 mm. Motorized 400/3/50. Complete with label attachments and heat sealing device. Conveyor feed approx. 55 per min.

Two 72 in. **HYDRO EXTRACTORS** by Thomas Broadbent, 72 in. galv'd basket, 20 in. deep, $\frac{1}{2}$ in. perfs. Motorized 400/3/50.

Two 39 in. oscillating **HYDRO EXTRACTORS**, with rubber covered baskets 39 in. by 16 $\frac{1}{2}$ in. deep. 3 point suspension, 4 in. outlet in Monitor. Motorized 400/3/50.

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"**DAWSON**" **HYDRO BOTTLE WASHING MACHINE.**
Enc. Steel **MIXER** 5 ft. 6 in. by 3 ft. 6 in. diam. O/H bevel drive.

"**Spencer**" Hopwood Oil fired **BOILER**, 1380 lbs. evap., 100 lbs. w.p.

CONDENSERS: 7 ft. by 2 ft., 174- $\frac{1}{2}$ in. steel tubes, also six Brass shell, 3 ft. 6 in. by 5 in.—325- $\frac{1}{2}$ in. copper tubes.
"Werner" Twin blade **TIPPING MIXERS**, 29 in. by 27 in. by 19 in. and 25 in. by 25 in. by 20 in. deep.

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NORTHEY-BOYCE Twin Rotary Dry **VACUUM PUMP** 180 c.f.m. or 364 c.f.m. series or parallel running mounted on Bedplate.

Several Lacey-Hulbert **VACUUM PUMPS** from size 0. Vertical Egg-Ended **PRESSURE VESSELS** 5 ft. by 12 ft. 6 in. 100 lbs. p.s.i. $\frac{1}{2}$ in. plate.

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MORWARD "U" shaped **MIXERS** with scroll type agitators, electrically driven through reduction gears, sizes 4 ft., 6 ft. and 8 ft. long.

Selection of **JACKETED FANS** from 40 to 450 gallon, arranged with stirring gear from fast and loose pulley or electric motor and gear box.

A LARGE SELECTION of all sizes and shapes of **MIXERS**, coil-heated or jacketed, motorised or fast and loose pulley drives.

HYDRO EXTRACTORS

72 in., 60 in. and 48 in. by **BROADBENT**, all electric, under driven, direct coupled.

TWO 42 in. by **WATSON LAIDLAW**, all electric, under driven through Vee ropes from flange mounted vertical spindle motor, 3 point suspension.

TWO 36 in. and **ONE** 30 in. by **BROADBENT**, all electric, driven through flat belt from flange mounted vertical spindle motor, steel baskets.

All machines suitable for 400/3/50 supply and complete with cabinet starters.

HOPKINSON'S CENTRIFUGES types 3 and 4 with built in motors.

Numerous sizes all bronze, brass tube **CONDENSERS** and **HEAT EXCHANGERS**.

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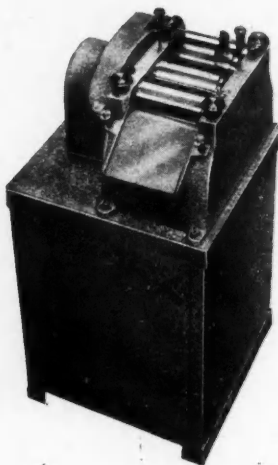
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